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# REVIEW OF THE SNAILFISH GENUS *CAREPROCTUS* (LIPARIDAE, SCORPAENIFORMES) IN ANTARCTIC AND ADJACENT WATERS

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**ABSTRACT.** The family Liparidae is one of the most speciose of the Antarctic fish fauna, outnumbering even the Nototheniidae. The genus *Careproctus* in the Southern Hemisphere includes 40 described species and at least 3 undescribed ones, distributed from depths of about 6 m to over 5000 m, most from polar waters. This paper reviews the species of *Careproctus* from the Antarctic and adjacent waters, defined as waters south of 50°S latitude, including the Straits of Magellan, Macquary Island, South Orkney Islands, South Georgia Island, the Falkland Islands, South Sandwich Islands, and other islands. We describe 18 new species (*C. acifer* n. sp., *C. amplexiceps* n. sp., *C. catherinae* n. sp., *C. eltaninae* n. sp., *C. fedorovi* n. sp., *C. improvisus* n. sp., *C. inflexidens* n. sp., *C. lacmi* n. sp., *C. leptorhinus* n. sp., *C. minimus* n. sp., *C. parviporatus* n. sp., *C. pseudoprofundicola* n. sp., *C. rimiiventris* n. sp., *C. sandwichensis* n. sp., *C. scaphopterus* n. sp., *C. tricapitidens* n. sp., *C. vladibeckeri* n. sp., and *C. zispi* n. sp.), report 3 second or third records of rare species (*C. novaezelandiae* Andriashev 1990; *C. parini* Andriashev and Prirodina 1990a; *C. polarstermi* Duhamel 1992), redescribe 4 species (*C. georgianus* Lönnberg 1905, *C. polarstermi* Duhamel 1992, *C. profundicola* Duhamel 1992, and *C. longipectoralis* Duhamel 1992), briefly describe *C. continentalis* Andriashev and Prirodina 1990, *C. credispinulosus* Andriashev and Prirodina 1990, *C. falklandicus* (Lönnberg 1905), and *C. steini* Andriashev and Prirodina 1990, and provide keys to the identification of all species included herein. In addition, we discuss the ichthyogeography of Antarctic benthic fishes. Thus, the fish fauna of the Antarctic region includes 28 species of the genus *Careproctus*.

## INTRODUCTION

In 1990, *Fishes of the Southern Ocean* (Gon and Heemstra) summarized knowledge of the Antarctic fish fauna and clearly demonstrated that the Liparidae is one of the most speciose families in the region (broadly defined as waters in and south of the Antarctic Convergence). In their chapter on liparids, Stein and Andriashev (1990) reviewed the liparid fauna in so far as it was known then. Unfortunately, owing to lack of time, they were unable to complete the section on *Careproctus* Krøyer 1862 and included only one species, *C. georgianus* Lönnberg 1905. As a consequence, they cautioned users of the *Careproctus* section that "specimens now in collections suggest that at least 17 more species exist in the area." This prediction has proven to be correct: 7 additional species have been described from waters surrounding the Antarctic continent, 11 from Patagonia, and 1 from New Zealand in addition to the 18 described herein, for a total of 40 described Southern Hemisphere *Careproctus* species. Additionally, Stein is describing at least 3 more undescribed species from Australia and the Galapagos Islands. From the Antarctic, Andriashev and Prirodina (1990a) described *C. parini*,

*C. steini*, *C. continentalis*, and (1990b) *C. credispinulosus*; and Duhamel (1992) described *C. profundicola*, *C. polarstermi*, and *C. longipectoralis*. From Patagonia, Andriashev (1990b; 1991a, b, c; 1992a) described *C. acaecus*, *C. aculeolatus*, *C. armatus*, *C. atrans*, *C. aureomarginatus*, *C. cactiformis*, *C. herwigi*, *C. macranchus*, *C. novaezelandiae*, and *C. smirnovi*. From Chile, Andriashev (in press) is describing a new *Careproctus*. The Patagonian, Chilean, South African, and Australian species (also including *C. pallidus* (Vaillant 1888), *C. crassus* De Buen 1961, *C. albescens* Barnard 1927, *Paraliparis australis* Gilchrist 1902, not listed above) will not be reviewed here. However, the reader should be aware of them because their distributions are poorly known and it is possible that some may occur peripherally in or near the Antarctic Convergence zone.

This paper should be considered as the *Careproctus* section for Stein and Andriashev (1990). It reviews all known species of *Careproctus* from the Antarctic Ocean and adjacent waters (the same region covered by Stein and Andriashev 1990) including the material from collections made by the United States Navy Ship *Eltanin* and now held by the Natural History Museum of Los Angeles County and the Zoological Institute, Russian Academy of Sciences, St. Petersburg. We know of no other undescribed liparid specimens (the *Eltanin* specimens were the subject of an unpublished 1977 MS thesis by Tompkins), and this paper thus comple-

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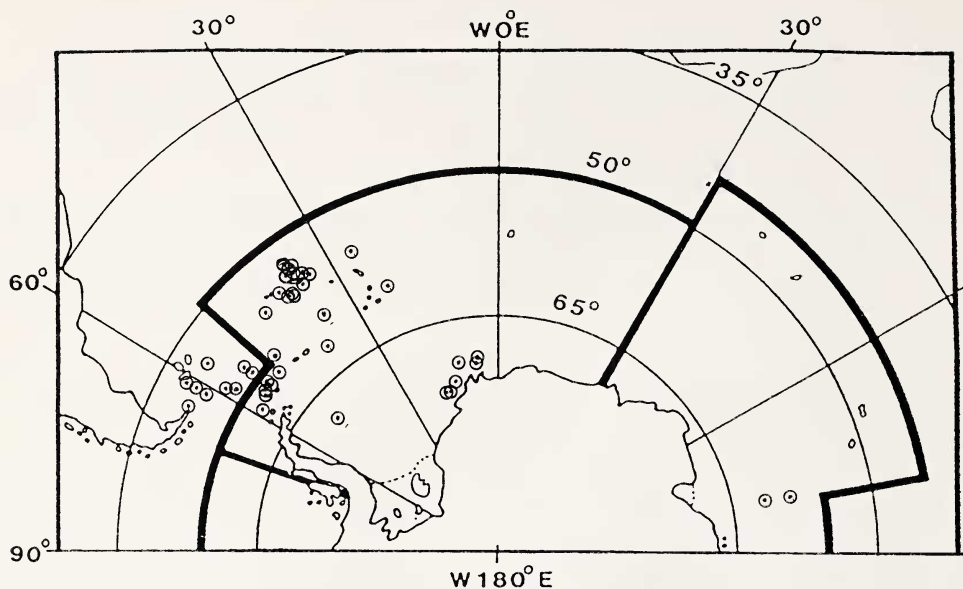


Figure 1. Distribution of Antarctic sampling stations at which *Careproctus* specimens were collected, from 0° to 90°W and E. Heavy black borders show area included in *Fishes of the Southern Ocean* (modified from Gon and Heemstra 1990).

ments and completes our review of Antarctic liparid species in *Fishes of the Southern Ocean* (Stein and Andriashev 1990). Twenty-eight species of *Careproctus* are known from the Southern Ocean; the distribution of the stations from which they were collected are shown in Figs. 1 and 2. We describe, redescribe, or briefly discuss all known *Careproctus*, including 18 new species: *C. acifer* n. sp.,

*C. amplexus* n. sp., *C. catherinae* n. sp., *C. eltaninae* n. sp., *C. fedorovi* n. sp., *C. improvisus* n. sp., *C. inflexidens* n. sp., *C. lacmi* n. sp., *C. leptorhinus* n. sp., *C. minimus* n. sp., *C. parviporatus* n. sp., *C. pseudoprofundicola* n. sp., *C. rimiventris* n. sp., *C. sandwichensis* n. sp., *C. scaphopterus* n. sp., *C. tricapitidens* n. sp., *C. vladibeckeri* n. sp., and *C. zispi* n. sp. We redescribe four species (*C. georgianus*, *C.*

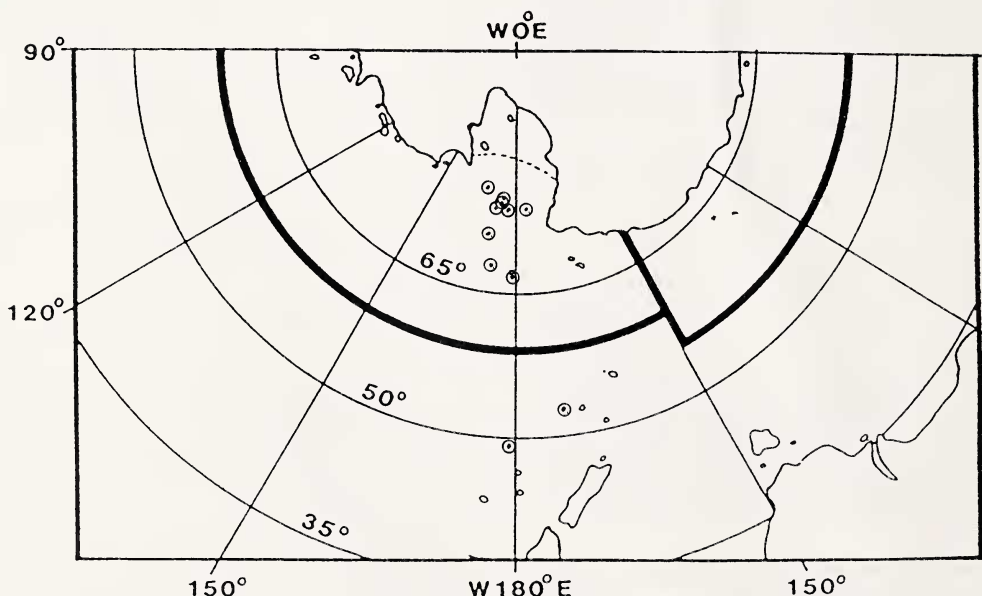


Figure 2. Distribution of Antarctic sampling stations at which *Careproctus* specimens were collected, from 180° to 90°W and E. Heavy black borders show area included in *Fishes of the Southern Ocean* (modified from Gon and Heemstra 1990).



*polarsterni*, *C. profundicola*, and *C. longipectoralis*) including data from additional specimens for all except the last. Brief descriptions of *C. continentalis*, *C. credispinulosus*, *C. falklandicus*, *C. novaezelandiae*, *C. parini*, and *C. steini* are included also. Finally, we provide a key to the above listed species and a short discussion of Antarctic ichthyogeography.

## METHODS

We generally follow the terminology of Hubbs and Lagler (1964) for ichthyological measurements and definitions with some exceptions involving terms and measurements specific to liparids. For such definitions, we have been guided by Burke (1930), Stein (1978), Andriashev and Prirodina (1977), Andriashev (1986), Kido (1988), and Stein and Andriashev (1990). We follow Stein and Andriashev (1990) except as discussed below. The terminology of liparid taxonomy, in particular that of the cephalic pore system, has not been standardized and in some respects has become confusing; we standardize it in this paper. We discuss several characters and their polarities (cephalic pores, pectoral girdle, abdominal and caudal vertebrae, hypural and caudal fin complex) and present our reasoning and conclusions. Below, we define terminology, abbreviations, and descriptions to reduce confusion and provide standards for future use by liparid students.

Liparids are difficult to study for a variety of reasons (Burke 1930; Stein 1978), among which is a general absence of external characters. Furthermore, the morphological trend of liparid evolution is clearly reductive. Although there has been no cladistic analysis of the family, or even of a single genus, the family Cottidae has long been considered to be the sister group of the cyclopteroids (liparids and cyclopterids together) (Garman 1892; Burke 1930; Yabe 1985; Kido 1988; and others). On that basis, shallower-living genera (*Liparis* Scopoli 1777, *Polypera* Burke 1912), which have more elements in the pectoral and caudal complexes (similar to cottids), have plesiomorphic character states and are primitive relative to genera such as *Paraliparis* Collett 1878. In the more advanced (usually deeper-living) genera and species, bony elements are generally lost and fused. Species of *Careproctus* show a broad spectrum of character states, apparently related to depth of occurrence. Thus, the presence of more elements, whether in the caudal complex (presence of epurals, multiple or divided hypurals) or pectoral fin and girdle (more fin rays, more radials), is usually plesiomorphic, although one clear exception is the increasing number of vertebrae and related dorsal and anal fin rays in deep-water species and genera. Reduction of one character suite is not always correlated with that of another, and the reductive trend tends to result in few synapomorphies that are morphologically more complex or have more parts. Thus, there has been no synoptic review of the family at the species level since Burke (1930), although Kido (1988) reviewed the Japanese species, discussed characters in depth, and provided a cladogram based on those characters. However, his phylogenetic analysis was of a paraphyletic group defined solely by their occurrence within the region he was considering (western North Pacific near Japan, Sea of Okhotsk, and western Bering Sea).

Different authors have used a variety of terms for the pores of the cephalic canal system. Burke (1930) provided a widely adopted terminology that was standard until Andriashev (1975, 1986, 1993) more accurately described and named the pores based upon their morphological re-

lationships relative to the canals of the cephalic lateralis system, into which they open. The relationship of the cephalic pores with the canals was first studied by injecting the canals with ink (Matsubara and Iwai 1954) and defined by Andriashev (1975). Matsubara and Iwai described and figured the "rudimentary pores" of the temporal canal, but Pitruk (1991) demonstrated that these were not true pores, but rather were blind diverticulae, remnants of lost temporal and postcoronal pores similar to those occurring in the Cottidae, the sister group of the liparids and cyclopterids. Thus, these pores are plesiomorphic characters (Andriashev 1975, 1978; Pitruk 1991), actually present as pores only in *Notoliparis* Andriashev 1975, and *Pseudonotoliparis* Pitruk 1991. We follow the terminology of Stein and Andriashev (1990) with the addition of a further term, "circumoral pores," to describe the pores of the infraorbital maxillary and mandibular canals that directly surround the mouth. The terminal mandibular pore pair (one on each side of the mandibular symphysis), termed the symphyseal pores, are of particular interest and taxonomic use, though at the species level only; they may be closely or widely spaced, in a common depression, in a common pit, or fused into a single oblong or round pore (Andriashev 1986). These pores frequently remain even though the remainder of the skin is missing or damaged.

Furthermore, the skin of liparids often bears free neuromasts, occasionally widely scattered dorsally and laterally, especially near the head, but generally in the form of a "pseudo lateral line" of neuromasts in a similar position to a true lateral line, but unconnected by a canal. These have been called rudimentary pores (Burke 1930) but are neither rudimentary nor pores. Therefore, we use the correct term, free neuromasts.

Prickles may also be present in some species (Burke 1930, and many others). Although liparids lack scales, they may have slender, sharp spines or thumb-tack-like projections on the skin. Spiny prickles ("cactus-like") may occur singly or in clumps of up to four or five, tend to be deciduous, and often are lost during capture and subsequent handling; thumb-tack prickles are firmly attached by their broad base, do not occur in clumps, and tend to remain. Small pits in the skin are locations where cactus-like prickles have been lost. Distribution of prickles on the body varies by species: they may be all over the body or missing from certain areas, such as the inner surface of the pectoral fins and belly. The relationship of prickles size, density, and distribution to body size, sex, reproductive state, and other biological factors is unknown.

In the terminology of Andriashev (1986) and Kido (1988), abdominal vertebrae are those that are "anterior to the vertebrae bearing a definite haemal spine . . . without the pleural rib" (Kido 1988:152). Kido (1988) considered the presence of pleural ribs the characteristic feature defining *Careproctus*. However, as Kido observes, "the number of pleural ribs varies among and within species." This definition cannot be used for many, perhaps most, species to distinguish abdominal from caudal vertebrae. Most southern *Careproctus* lack pleural ribs (Andriashev and Prirodina 1990a, this paper). At least three conditions exist when they are present: two strong, saber-like ribs; two long, thin ribs; and one short, caudally directed rib.

Additionally, haemal spines themselves may abruptly or gradually change from short to long between abdominal and caudal vertebrae. In the former circumstance, distinguishing between the two sorts of vertebrae is difficult. Lateral radiographs do not always show fusion; clearing and staining will show it but can only be used for a few

specimens at best. The purpose of distinguishing between abdominal and caudal vertebrae is taxonomic; for that function, and considering the difficulty in clearly defining the two categories and in applying a definition, we have arbitrarily defined abdominal vertebrae as those anterior elements of the spine that do not support anal fin rays; caudal vertebrae bear interneurals and fin rays.

Andriashev (1986, 1990b, 1991a) and Andriashev and Prirodina (1990a, b) demonstrated the utility of the pectoral girdle as a taxonomic (useful for distinguishing among species) and systematic (useful for explaining relationships) character. In particular, the number and shape of radials, whether notched or unnotched, their arrangement, and the presence or absence of fenestrae between them are significant. Radial presence and position are denoted as proposed and described by Andriashev, Neyelov, and Prirodina (1977). Four primary patterns are known, of which the first and second have two variants: 1a, 3+1 = 4, in which all radials are present, but the distance between radials 3 and 4 is greater than that between the others (*Liparis*, *Careproctus*, and *Paraliparis*); 1b, 1+1+1+1 = 4, in which all radials are present and equidistant from one another although usually decreasing in size ventrally (*Liparis*, *Careproctus*, and *Paraliparis*); 2a, 1+1+1 = 3, radials equidistant (*Pseudonotus* Barnard 1927); 2b, 2+0+1 = 3, in which radial 3 is absent and radials 2 and 4 are very widely separated (*Careproctus* and *Paraliparis*); 3, 2+0+0 = 2 in which only the dorsal two radials remain (*Paraliparis*); 4, 1+0+0+1 = 2, "opposed," in which only the dorsal-most and ventral-most radials remain (*Careproctus* and *Edentoliparis* Andriashev 1990c). Other genera fit these patterns as far as is known.

The plesiomorphic state is the presence of four notched radials, unequally spaced (3+1), with the three upper radials separated by three interradial fenestrae (Fig. 20c) (Andriashev 1986). This pattern occurs in all *Liparis* species. In *Careproctus*, the plesiomorphic state is the same, but usually the more derived species have only rounded radials lacking notches and fenestrae, and the number of radials may be reduced. Southern species of *Careproctus* display the following patterns: radials 4 (3+1), notched: *C. albescens*, *C. catherinae* n. sp., *C. heruigi*, *C. novaezelandiae*, *C. parini*, *C. smirnovi*; radials 4 (3+1), unnotched (round): *C. aureomarginatus*, *C. credispinulosus*, *C. inflexidens* n. sp.; Radials 4 (1+1+1+1), "equidistant": *C. atrans*, *C. falklandicus*, *C. georgianus*, *C. macranchus*, *C. pallidus*, *C. sandwichensis* n. sp., *C. scaphopterus* n. sp., *C. steini*, *C. tricapitidens* n. sp., *C. zispi* n. sp.; Radials 3 (2+0+1): *C. acaecus*, *C. aculeolatus*, *C. armatus*, *C. continentalis*, *C. improvisus* n. sp., *C. lacmi* n. sp., *C. parviporatus* n. sp., *C. polarsterni*; Radials 2 (1+0+0+1), opposed: *C. acifer* n. sp., *C. amplexus* n. sp., *C. n. sp.* Atacama Trench, Chile, n. sp. *C. eltaninae* n. sp., *C. leptorhinus* n. sp., *C. minimus* n. sp., *C. pseudoprofundicola* n. sp., *C. rimiventris* n. sp., *C. vladibeckeri* n. sp. Occasionally, a radial arrangement intermediate between 4 (1+1+1+1) radials and 4 (3+1) occurs (*C. inflexidens* n. sp.). No *Careproctus* species are known with 2 (2+0+0) radials; only some species of *Paraliparis* from the Southern Hemisphere are known with this arrangement.

Radial shape and presence or absence of fenestrae between radials are taxonomically and systematically important. Radials may be round, oblong, or square, or they may be transitional between these shapes; in *Liparis* and *Careproctus*, they may also be notched to various degrees to accommodate the presence of fenestrae between the bony elements of the pectoral girdle. In *Liparis* and in

primitive *Careproctus*, only the primitive "hourglass" shape of radial is present (Andriashev 1986). Up to three fenestrae (f) may be present: f 1 between scapula and radial 1; f 2 between radials 1 and 2; and f 3 between radials 2 and 3. The scapula itself may also be notched on the surface facing radial 1. Presence of all three fenestrae is plesiomorphic, as is notched scapula and dorsal three radials (Andriashev 1986). In species where only two radials are present and the two intermediates are missing, the radials are termed "opposed."

The pectoral fin (P) is usually more or less deeply notched in *Careproctus*. Notch rays are shorter and often more widely spaced than other rays. If a notch is present, the fin ray formula will be trinomial, e.g., P = 28 (21+3+4). If notch rays are not distinguished by spacing, the fin ray formula will be binomial, e.g., P = 28 (21+7). Typically, if the notch is absent or poorly developed, the lower lobe will consist of more rays than when the notch is clear and well defined. Intermediate states are not uncommon, and it can be difficult to decide how to describe the fin ray arrangement by formula.

The shape of the coracoid and its associated lamellar strengthening plates or lateral ribs is also notable. The coracoid itself is shaped somewhat like a double-bladed axe, with the helve (handle) variable in length; this can be seen clearly in the different species described here. The lamellar plates may be short and narrow to long and wide, but in any event the helve length and size of the lamellar plates are probably characteristic for different species, although not necessarily clearly defining characters for every species. The systematic significance of the presence and degree of development of the lamellar ribs is unclear, as there are frequent infraspecific variations.

The hypural complex is also of taxonomic and systematic use. In *Careproctus*, the elements (upper and lower hypural plates, parhypural, and epural) may be fused or reduced to various degrees depending upon species. A high degree of fusion is a derived character, and the less fusion the more plesiomorphic; all species of *Liparis* have many free elements, whereas most species of *Paraliparis* and other derived genera have the caudal complex reduced to a single unit composed of the fused hypural, parhypural, and urostyle with no free epurals (Kido 1988). *Careproctus* species display almost the full range of variability, from completely divided or fused only at the base, with a slit (close to the state in *Liparis*), to almost completely fused (as in *Paraliparis*). Unfused and numerous elements are plesiomorphic; thus, the presence of a partially divided hypural or unfused parhypural and epurals may be synapomorphic.

The caudal fin consists of principal rays arranged on the posterior margin of the hypural plate(s), with procurrent rays sometimes present above and/or below the principal rays (see Stein 1978). The presence and greater abundance of procurrent rays is plesiomorphic; reduction in number of procurrent or principal rays is apomorphic. Therefore, the number and position of all rays is important and must be considered. For example, C 13 (3+5/4+1) indicates 3 dorsal and 1 ventral procurrent rays, and 5 dorsal and 4 ventral principal rays, respectively.

Number of specimens examined and their institutional distributions are given in Table 1. With one exception we follow Leviton, Heal, and Dawson (1985) and Leviton and Gibbs (1988) for collection abbreviations (ISH: Institut für Zeeffische, University of Hamburg; LACM: Natural History Museum of Los Angeles County; MNHN: Museum National d'Histoire Naturelle, Paris; NRM: Naturhistoriska Riksmuseet, Stockholm; USNM: National



Table 1. Number of specimens studied and source.

|                       |    |                            |
|-----------------------|----|----------------------------|
| LACM                  | 84 | Number of species: 28      |
| ZISP (St. Petersburg) | 25 | Number of new species: 18  |
| USNM                  | 8  | Second or third records: 7 |
| ISH (Hamburg)         | 6  |                            |
| MNHN (Paris)          | 2  |                            |
| NRM (Stockholm)       | 2  |                            |

Museum of Natural History, Washington). We have changed ZIL (Zoological Institute of Leningrad) to ZISP (Zoological Institute of St. Petersburg, Russian Academy of Sciences) because the museum has changed its name and no longer uses ZIL in collection numbers. Preparations of the pectoral girdle are accessioned in the ZISP collection. For convenience, we use the following abbreviations for counts and measurements:

*For counts*  
A: anal-fin rays  
C: caudal-fin rays  
D: dorsal-fin rays  
gr: number of gill rakers on the outside of first arch  
P: pectoral-fin rays  
pc: pyloric caeca  
V: vertebrae  
pores: sensory pores of the cephalic series, given in the order nasal, premaxillary, preoperculomandibular, and suprabranchial

*For measurements*  
aAf: distance from center of anus to anal fin origin  
bd: maximum body depth  
bdA: depth at anal fin origin  
da: distance from posterior edge of disk to center of anus  
disk: longitudinal diameter of disk  
E: eye diameter horizontally  
gs: length of gill slit  
HL: head length  
io: interorbital width  
LPL: greatest length of lower lobe of pectoral fin  
ma: length from mandibular symphysis to center of anus

md: length from mandibular symphysis to anterior edge of disk  
NL: length of shortest notch ray  
preA: preanal fin length  
preD: predorsal length  
radial: pectoral radial  
sn: snout length  
SL: standard length  
uj: upper jaw length  
UPL: greatest length of upper lobe of pectoral fin

All proportions are in percent of SL except when in parentheses, when they represent percent HL. Paratype measurements are in brackets. Unless otherwise noted, all radiographs are numbered by specimen accession number. All drawings of tooth pattern and shape are from Tompkins (1977).

The key should only be used as a first step towards identification; users should always verify identifications by going to the full description and comparing it with the specimen. It is not uncommon for radiographs to be required for certainty of vertebral, dorsal-fin, anal-fin, and caudal-fin ray counts. Notwithstanding, damaged specimens may be impossible to identify positively even with direct comparison to types. Because many of these species

are known from few specimens, their geographic and bathymetric ranges are poorly known; some could be circum-Antarctic.

KEY TO SOUTHERN OCEAN SPECIES  
OF THE GENUS CAREPROCTUS

- 1a. Anal-fin rays 27–38, vertebrae 38–48 . . . 2
- 1b. Anal-fin rays 39–54, vertebrae 50–64 . . 11
- 2a. Anal-fin rays 27–35, vertebrae 38–44. Pectoral fin unnotched, lower lobe absent . . . . 3
- 2b. Anal-fin rays 34–38, vertebrae 46–48. Pectoral fin deeply notched, lower lobe distinct . . . . . 4
- 3a. Mouth inferior. Two suprabranchial pores. Teeth tritubercular. Anal-fin rays 27–30, vertebrae 38–40 . . . . . *C. falklandicus*
- 3b. Mouth terminal. One suprabranchial pore. Teeth simple. Anal-fin rays 35, vertebrae 44 . . . . . *C. minimus* n. sp.
- 4a. Pectoral-fin rays 32–38. Caudal-fin rays 14 . . . . . 5
- 4b. Pectoral-fin rays 25–28. Caudal-fin rays 8–11 . . . . . 6
- 5a. Pectoral-fin rays 32–33. Disk 8–10% SL. Lateral lobes of teeth well developed, sharp. Peritoneum brown . . . . . *C. parini*
- 5b. Pectoral-fin rays 37–38. Disk about 13% SL. Lateral lobes of teeth rather weakly developed or shouldered, blunt. Peritoneum pale . . . . . *C. catherinae* n. sp.
- 6a. Gill-slit length 11–12% SL, extending ventrally in front of 4–9 pectoral-fin rays . . . 7
- 6b. Gill-slit length 5.5–7.5% SL, completely above pectoral-fin base . . . . . 8
- 7a. Head length about 34% SL, preanal-fin length about 42%, disk 7–8%. Mandibular pores large, oval, symphyseal pores closely spaced (Fig. 5b) . . . . . *C. ampliceps* n. sp.
- 7b. Head length 27–28% SL, preanal-fin length about 33%, disk 10–11%. Mandibular pores small, round, symphyseal pores widely spaced (Fig. 10b) . . . . . *C. eltaninae* n. sp.
- 8a. Skin covered with small needle-like prickles, easily lost (traces remain as small “crater-like” pits, Fig. 3d, 4b). Caudal-fin rays 8. Pyloric caeca short, about 3% SL (distance between anterior mandibular pores equal to or greater than their diameter) . . . . . *C. acifer* n. sp.
- 8b. Skin smooth, without prickles and pits. Caudal-fin rays 9–11. Pyloric caeca absent or elongated, 5–6% SL (if short, distance be-



- tween anterior mandibular pores much less than their diameter, Fig. 14b) . . . . . 9
- 9a. Disk about 13% SL. Pyloric caeca elongate, 5–6% SL . . . . . *C. lacmi* n. sp.
- 9b. Disk 8–11% SL. Pyloric caeca short (about 3.5% SL) or absent . . . . . 10
- 10a. Mandibular pores small, round, symphyseal pores spaced, interspace between them exceeds the pore diameter (Fig. 12b). Pyloric caeca absent. Eye 15–16% HL . . . . .
- . . . . . *C. fedorovi* n. sp.
- 10b. Mandibular pores large, oval, interspace between them less than the pore diameter (Fig. 14b). Pyloric caeca 7. Eye 21–22% HL . . . . .
- . . . . . *C. improvisus* n. sp.
- 11a. Pectoral-fin rays 37–38. Stomach black; teeth trilobed, sharp. Caudal-fin rays 12 . . . . .
- . . . . . *C. novaezelandiae*
- 11b. Pectoral-fin rays 21–35. Stomach not black; teeth usually simple, rarely trilobed. Caudal-fin rays rarely 12 . . . . . 12
- 12a. Pectoral-fin rays 34–35. Two suprabranchial pores. Body covered with small thumb-tack prickles . . . . . *C. credispinulosus*
- 12b. Pectoral-fin rays 21–33. One suprabranchial pore. Thumb-tack prickles absent . . . . . 13
- 13a. Anal-fin rays about 54, vertebrae about 64. Interspace disk to anus 35–36% HL. Tips of teeth recurved . . . . . *C. inflexidens* n. sp.
- 13b. Anal-fin rays 50 or fewer, vertebrae 60 or fewer. Interspace disk to anus no more than 30% HL. Teeth not recurved . . . . . 14
- 14a. Symphyseal mandibular pores opening in a common pore (Fig. 22b). Pectoral-fin rays 28–31, vertebrae 51–55, anal-fin rays 41–45. Gill slit extending ventrally in front of 1–3 pectoral-fin rays . . . . . *C. polarsterni*
- 14b. Mandibular symphyseal pores always paired, closely or widely spaced, sometimes opened in a shallow pit but not in one common pore . . . . . 15
- 15a. Teeth trilobed. Head length 18–21% SL . . 16
- 15b. Teeth simple. Head length 22–30% SL . . 17
- 16a. Tips of teeth bluntly rounded, tubercle-like. Caudal-fin rays 8. Preanal-fin length about 39% SL. Eye 29–30% HL. Stomach pale . . . . .
- . . . . . *C. tricapitidens* n. sp.
- 16b. Tips of teeth sharp, either acutely or right-angled. Caudal-fin rays 10. Preanal-fin length about 28% SL. Eye about 18% HL. Stomach covered with branching black pigmented blood vessels . . . . . *C. leptorhinus* n. sp.
- 17a. Pectoral-fin rays 30–33. Mandibular symphyseal pores closely spaced and usually opening in a shallow pit (not in a pore, Fig. 22b) (Figs. 13, 28) . . . . . 18
- 17b. Pectoral-fin rays 21–29. Mandibular symphyseal pores widely or more closely spaced but not opening in a pit (Fig. 7) . . . . . 19
- 18a. Anal-fin rays 45–48, vertebrae 56–60. Width of head usually more than its depth. Pyloric caeca 4, tubercle-like. Eye 4.4–4.8% SL. Pectoral fin weakly notched; lower lobe rays mostly inside membrane (Fig. 13). Peritoneum pale, undotted . . . . . *C. georgianus*
- 18b. Anal-fin rays 39–41, vertebrae 50–51. Width of head less than its depth. Pyloric caeca absent. Eye 6.3–7.6% SL. Pectoral fin deeply notched; lower lobe rays mostly free from membrane (Fig. 28). Peritoneum pale, black dotted . . . . . *C. steini*
- 19a. Gill slit long, nearly horizontal, opening ventrally (Fig. 25a). Origin of the upper pectoral-fin ray under anterior part of preopercle . . . . .
- . . . . . *C. rimiiventris* n. sp.
- 19b. Gill slit vertical or oblique. Origin of the upper pectoral-fin ray under posterior part of preopercle or more caudal . . . . . 20
- 20a. Gill slit short or moderate, 3.0–7.6% SL, completely above pectoral-fin base or extending ventrally in front of 1 or 2 pectoral-fin rays. Mouth horizontal . . . . . 21
- 20b. Gill slit long, 10–12% SL, extending ventrally in front of 5–9 pectoral-fin rays. Mouth oblique . . . . . 25
- 21a. Anal-fin rays 40–42, vertebrae 50–52. Pectoral fin deeply notched, shorter than HL, 17–21% SL . . . . . 22
- 21b. Anal-fin rays 43–47, vertebrae 56–60. Pectoral fin notch shallow or absent, pectoral-fin length exceeds or equals HL, 24–30% SL . . . . .
- . . . . . 24
- 22a. Preanal-fin length 33–37% SL. Margin of disk slightly sculptured with sectors. Pyloric caeca absent. Peritoneum not pigmented . . . . .
- . . . . . *C. continentalis*
- 22b. Preanal-fin length 42–46% SL. Margin of disk smooth. Pyloric caeca present, 4–12. Peritoneum light brown or brown-black . . . . . 23
- 23a. Head length 22–23% SL. Pyloric caeca 4, short, 3–4% SL. Upper jaw not extending to below anterior margin of eye. Peritoneum light brown . . . . . *C. parviporatus* n. sp.
- 23b. Head length 28–30% SL. Pyloric caeca 10–12, elongated, 7–8% SL. Upper jaw extending behind anterior margin of eye. Peritoneum brown-black . . . . *C. vladibeckeri* n. sp.
- 24a. Mouth inferior. Disk round. Eye about 2% SL or 8.5% HL. Pectoral-fin length about equal to HL; pectoral-fin notch present, not deep. Peritoneum pale . . . . . *C. sandwichensis* n. sp.
- 24b. Mouth terminal. Disk slightly oval. Eye 3.0–3.4% SL. Pectoral fin longer than HL, unnotched, paddle-like. Peritoneum dark brown-black . . . . . *C. scaphopterus* n. sp.
- 25a. Anal-fin rays 39–41, vertebrae 50–52. Interspace disk to anus about 13% HL . . . . 26
- 25b. Anal-fin rays 46–47, vertebrae about 58. Interspace disk to anus 4.3–5.7% HL . . . . 27
- 26a. Pectoral fin shorter than or equal to HL. Body pale. Pyloric caeca short, about 2% SL . . . . .
- . . . . . *C. zispi* n. sp.
- 26b. Pectoral fin longer than HL. Body dark brown with small pale spots (life color). Py-

- loric caeca elongate, greater than 2% SL . . .  
 . . . . . *C. profundicola*
- 27a. Pectoral fin length about 160% HL. Pyloric  
 caeca 11. Eye 25–26% HL. Body uniformly  
 bright violet, pectoral fin dark, nearly black  
 . . . . . *C. longipectoralis*
- 27b. Pectoral fin length about 124% HL. Pyloric  
 caeca absent. Eye 18–19% HL. Life color of  
 body dark, gray-brown with small pale spots,  
 pectoral fin rather pale . . . . .  
 . . . . . *C. pseudoprofundicola* n. sp.

## SYSTEMATICS

### Order Scorpaeniformes

### Family Liparidae

### Genus *Careproctus* Kroyer 1862

### *Careproctus acifer* n. sp.

Figures 3, 4

**DIAGNOSIS.** V 48 (11+37), P 28, C 8 (4/4). Pleural ribs absent, hypural plate single, slit; parhypural narrowly separated from hypural. Radials two, round, opposed, 1+0+0+1. Mouth terminal, teeth simple. Gill slit completely above P base. Body covered with small needle-like prickles (single or 2–3), easily lost; traces remain as small “crater-like” pits. Head 25.9, preA 40.3, disk 8.3% SL. Body and orobranchial cavity pale, peritoneum dark brown.

**DESCRIPTION.** *Counts:* D 43, A 35, P 28, C 8, V 48; pores 2-6-7-1, gr 9, pc 9. *Ratios:* Head 25.9% SL, width about 15, bd 24.0, bdA 15.7, preA 40.3, disk 8.3 (32). Md 13.6, ma 25.5, da 4.8 (18.6), aAf 17.6, UPL 19.4 (75), NL 6.5, LPL 22.2, eye 6.0 (23), sn 8.0 (31), upper jaw 11.6 (45), gs 7.4 (26.4).

Head moderately long, compressed, width less than two-thirds its depth. Dorsal contour hump-backed, sloping steeply from high occiput to obliquely blunt snout. Mouth terminal, slightly oblique, snout barely projecting. Upper jaw reaching to below anterior margin of pupil. Teeth in both jaws small, simple, conical, about 30–35 oblique rows of up to 4–5 teeth each in the premaxillary; mandibular teeth similar; symphyseal gap present in premaxilla, absent in mandible (Fig. 4a). Eye moderately large. Nostril short, tubular. Circumoral pores large, oval, with thickened edges. Symphyseal pores spaced, interspace pm 1–pm 1 about equal to maximum pore diameter and to interspace pm 1–pm 2. Fifth infraorbital pore horizontally aligned with others, below posterior margin of eye. Postorbital (t 1) and upper preoperculomandibular (pm 7) pores small, the latter level with lower margin of pupil. Suprabranchial pore single, well dorsal and anterior to upper margin of gill slit at a distance about equal to eye diameter. Gill slit completely above P base but comparatively long. Oper-

cular flap moderate, projecting at dorsal end of gill slit.

Pectoral fin deeply notched, not quite reaching anal fin origin. Rays shortened ventrally to 20th ray, which is one-third of upper pectoral lobe length. Lower lobe of eight rays, the longest (seventh from bottom) a little longer than the upper P lobe. Lower (anterior) pectoral rays short; lowest below middle of eye. Upper two-thirds of basal cartilaginous lamina broadly widened. Two radials, opposed, one below scapula and one above coracoid (1+0+0+1). Scapula hatchet-like; coracoid with small foramen and triangular helve owing to presence of large anterior and posterior lamellar plates (Fig. 3c).

Trunk deep. Interneural of first dorsal ray between fourth and fifth neural spines. Pleural ribs absent. Distinction between abdominal and caudal vertebrae obvious. Last D and A rays based on preurostylar vertebra, overlap the anterior third of caudal fin. Disk not large, anterior lobe moderately developed, margin smooth. Anus close to disk, located at about two-thirds of preanal distance. Caudal of 8 (4/4) principal rays, procurent rays absent. Hypural plate wide, slit. Parhypural unfused with lower hypural, distinctly separated by slit extending entire length of hypural.

Body entirely covered with small (ca 1 mm) needle-like prickles (Fig. 4b), single or two to three together (Tompkins 1977). Prickles easily lost, remaining on these specimens only in occasional spots; small “crater-like” pits remain (Fig. 3d). Pits visible on entire body and longitudinal fins, excluding disk and pectoral fin. Position of stomach unknown. Pyloric caeca short, thick, similar in size, about 3% SL.

In preservative, body pale. Orobranchial cavity pale, peritoneum dark brown, intestine orange.

**MATERIAL EXAMINED.** Holotype, LACM 10733-1, male, 122 mm TL, 108 mm SL, *Eltanin* Stn 542, 60°02'S, 49°09'W, 2906–2946 m, 7 March 1963. Pect. girdle N 671.

**DISTRIBUTION.** The holotype and only known specimen was collected in the abyssal Scotia Sea northwest of the South Orkney Islands at 2906–2946 m in a Menzies bottom trawl.

**ETYMOLOGY.** Specific epithet “acifer,” from the Latin “acus” (needle) and “fero” (to bear), from the needle-like prickles covering the body.

**COMMENTS.** Species of *Careproctus* with prickles and lacking pleural ribs are known from bathyal depths off Argentina (*C. cactiformis*, *C. armatus*, *C. aculeolatus*) and are meristically similar to *C. acifer*. However, *C. acifer* differs from all of them in having fewer caudal fin rays (8 vs 10–11) and pectoral radials (2 vs 3 or 4), in the presence of a separate parhypural, and in having large oval mandibular pores. In addition, dermal pits are absent in the Patagonian species.

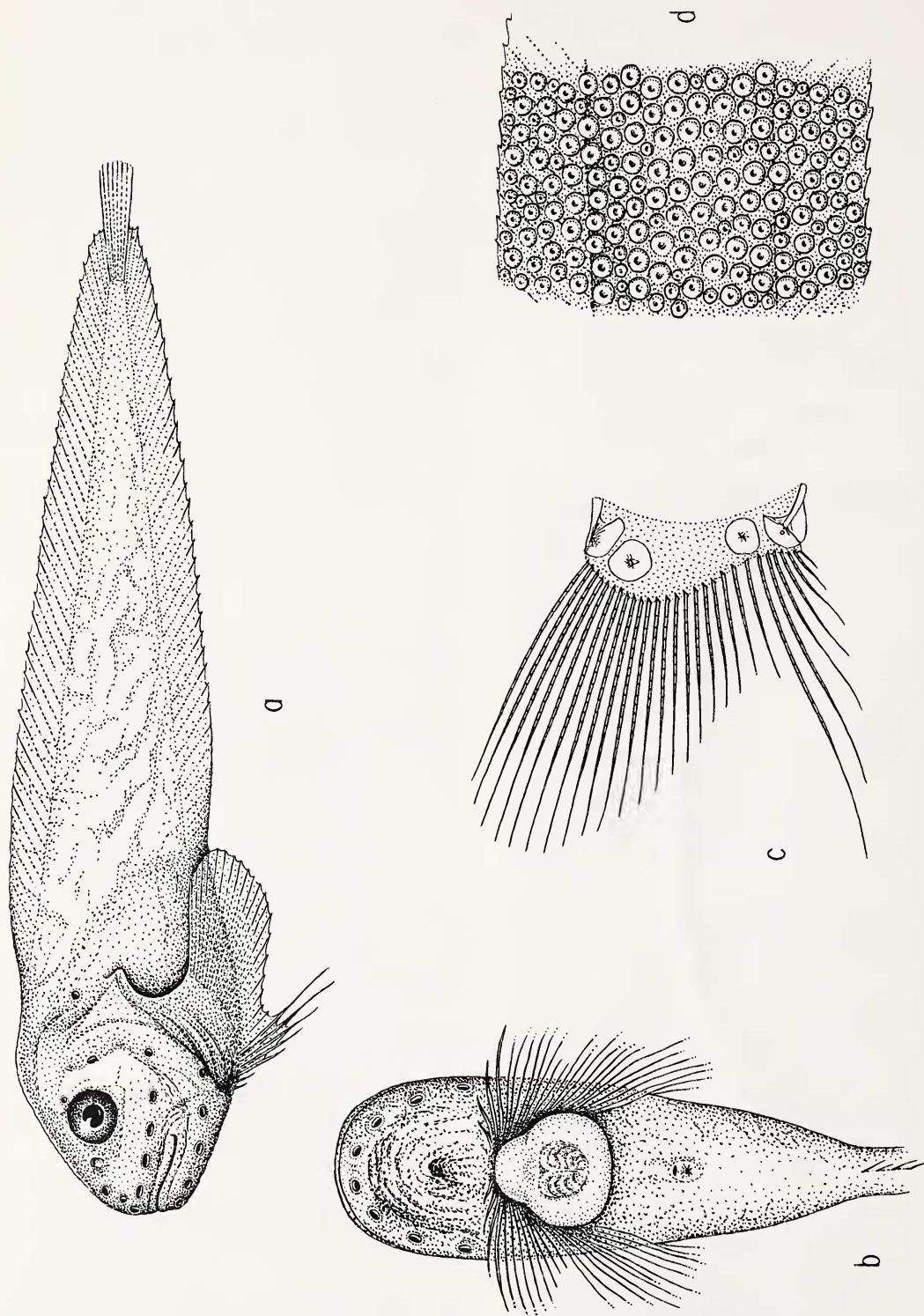


Figure 3. *Careproctus acifer* n. sp. Holotype, LACM 10733-1, 108 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, skin (prickles lost).



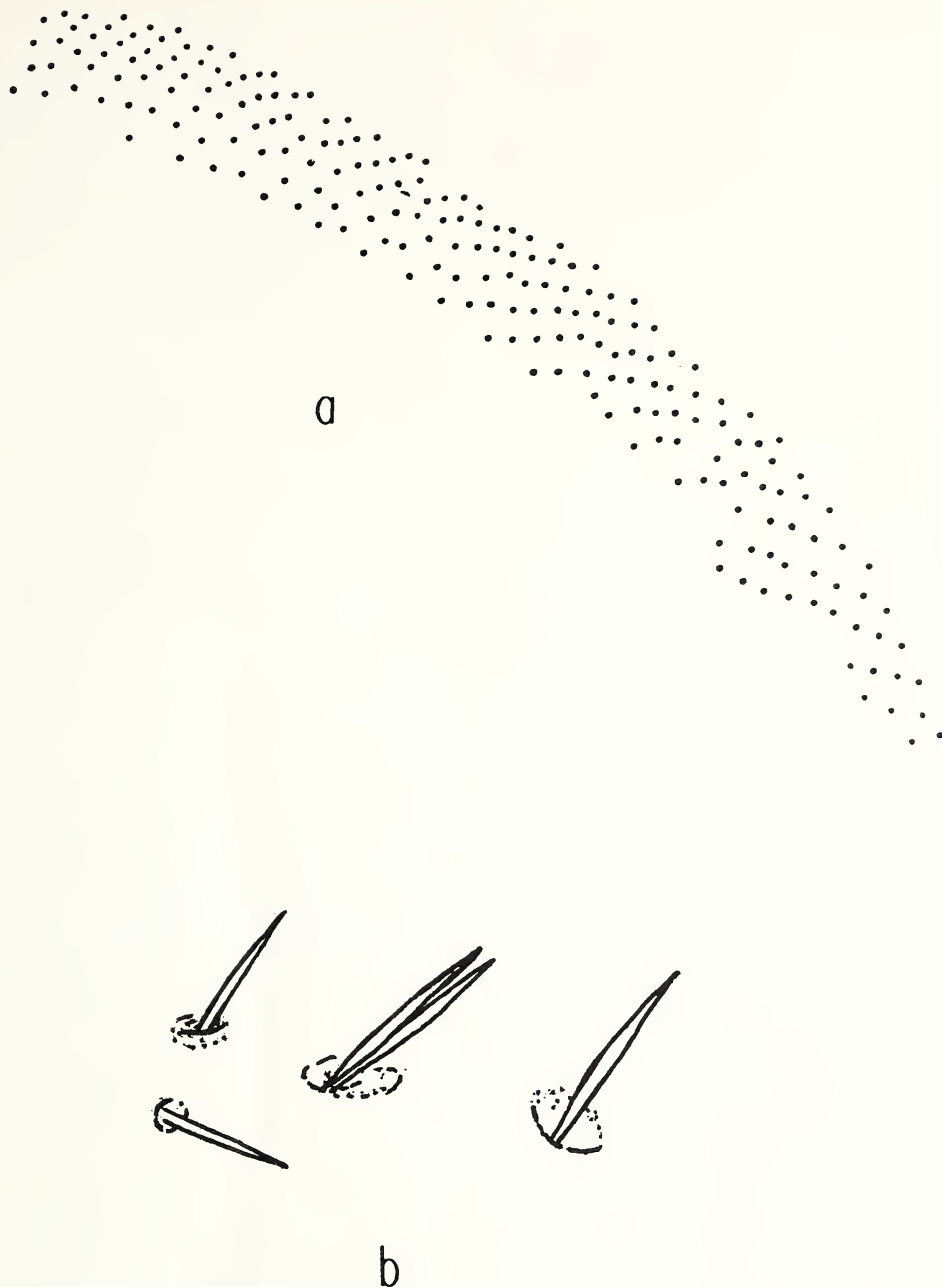


Figure 4. *Careproctus acifer* n. sp. Holotype, LACM 10733-1, 108 mm SL: a, tooth pattern; b, skin prickles. From Tompkins 1977.

***Careproctus ampliceps* n. sp.**

Figure 5

**DIAGNOSIS.** V 47 (12+35), P 25, C 9 (4/5), radials 2, round, 1+0+0+1. Pleural ribs absent, hypural plate single, unslit. Head large, compressed laterally, mouth terminal. Teeth small, simple. Mandibular pores large, oval. Gill slit vertical, large, 12% SL, extending down in front of 8–9 pec-

toral rays. HL 34.1, preA 41.8, disk 7.7% SL. Peritoneum brown-black, orobranchial cavity pale.

**DESCRIPTION.** *Counts:* D 40, A 34, P 25, C 9, V 47, radials 2, pores 2-6-7-1, gr 10, pc 10. *Ratios:* Head 34.1% SL, its width 17.6, bd 28.6, bdA 15.1, preD 36.8, preA 41.8, disk 7.7 (20.3% HL), md 19.2, ma 31.3, da 4.6 (13.5), aAf 15.1, UPL 23.1 (68), NL 5.5, LPL 26.3, eye 5.3 (18.4), sn ca 10 (29.5), gs 12.4 (36.5).

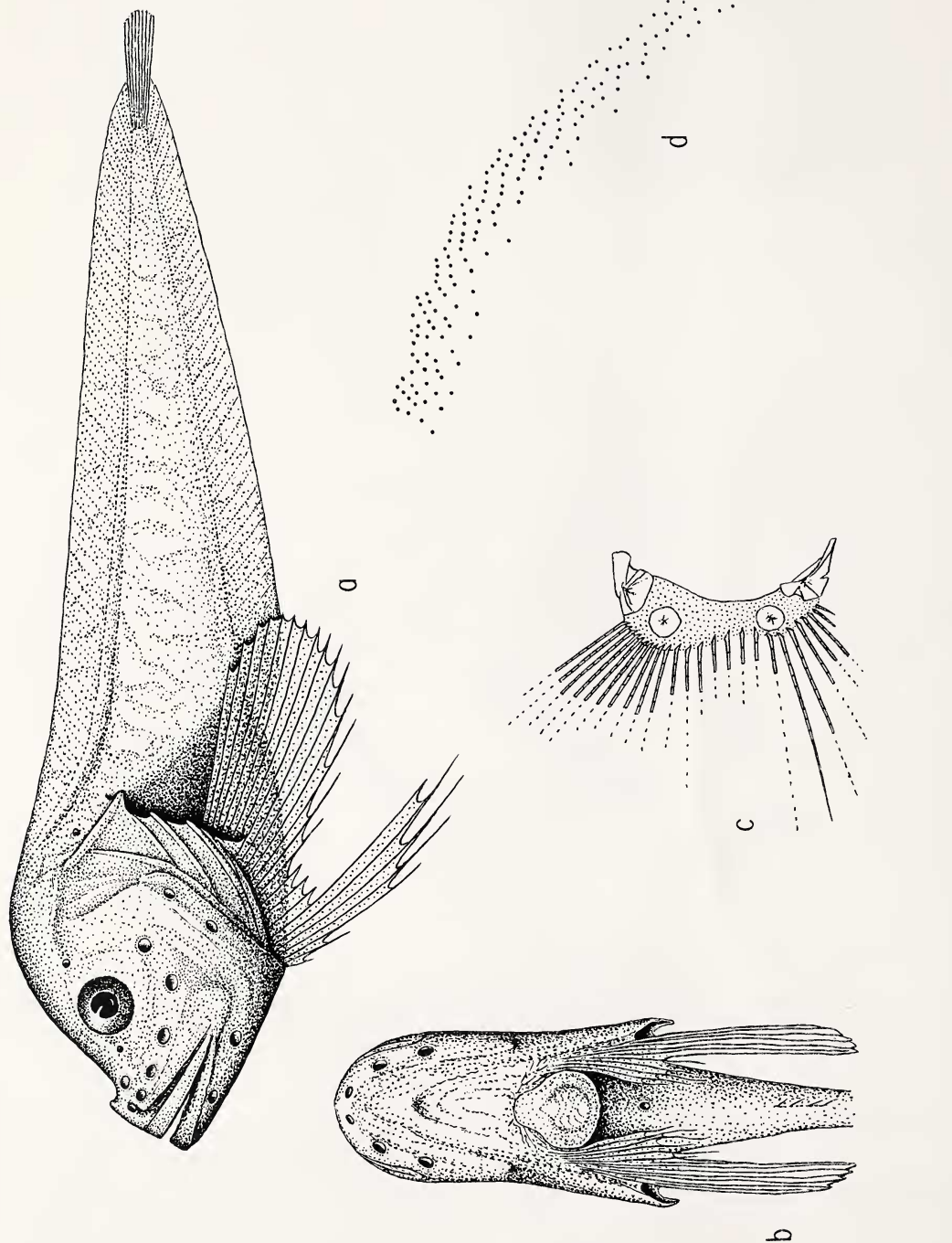


Figure 5. *Careproctus amplexiceps* n. sp. Holotype, LACM 11418-2, 91 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern (d from Tompkins 1977).

Head large, high, compressed laterally, its width nearly two-thirds its depth and one-half its length. Dorsal contour steeply sloping from a high occiput to unprojecting snout. Mouth terminal, slightly oblique, large. Symphysis of lower jaw slightly projecting. Upper jaw reaching below posterior half of eye. Tooth bands in both jaws narrow, nearly meeting at symphysis. Teeth small, simple, conical, but some of the innermost slightly broader at bases though not developed into shoulders. Upper jaw with more than 25 irregular oblique rows of up to 6–7 teeth each; maximum width of premaxillary tooth band about 10% of band length (Fig. 5d). Nostril a small pore, one-half to one-third diameter of upper nasal pore (n 2). Circumoral pores large, contoured, mandibular pores oval, infraorbital pores round. Mandibular symphyseal pores separated, their interspace equal to longest diameter of one of them. Postorbital (t 1) and the upper preoperculumandibular pore (pm 7) small. Suprabranchial pore single, slightly above and anterior to gill slit. Gill slit large, nearly vertical, reaching ventrally in front of 8–9 pectoral rays. Opercular flap small, near upper end of gill slit. Opercle itself unusually straight.

Pectoral fin long, reaching well behind anal fin origin, deeply notched. Pectoral rays ventrally gradually shorter to 15th ray, next 3–4 rays much shortened, slightly more widely spaced. Lower pectoral lobe longer than upper, of seven rays, the sixth from bottom longest. Pectoral 25 (14–15+3–4+7). Basal cartilaginous lamina much broader dorsally, two round radials present: first below scapula, second above coracoid, opposed, 1+0+0+1 (Fig. 5c). Coracoid with a long helve, framed with lamellar plates, posteriorly wide, anteriorly narrow. Coracoid foramen absent.

Body tadpole-like, strongly tapering postabdominally, attenuate. Disk cupped, small. Anus two-thirds of distance to anal origin. Interneural of first dorsal ray between neural spines 6 and 7; therefore, predorsal distance unusually long. Pleural ribs absent. Abdominal vertebrae not easily distinguishable from caudal vertebrae. Parapophyses of posterior 2–3 abdominal vertebrae connected to form spines of gradually increasing length; 12th haemal spine of nearly full length; 13th spine supports first anal fin ray. Preurostylar vertebra bears posterior-most ray of dorsal and anal fins; these overlap anterior third of caudal fin. Hypural plate broken in holotype, unslit. Caudal fin of 8 (4/4) rays, procurrent rays absent.

Skin thin, movable. Tiny prickles present as single needles on lower jaw, snout, and occiput, in life possibly covering entire body, visible at 25× magnification; skin pits absent. Pyloric caeca digitate, similar in size, about 5% SL or shorter.

Body and orobranchial cavity pale. Peritoneum brown-black, stomach and pyloric caeca unpigmented. Ovaries with uniformly small oocytes, about 0.5 mm diameter.

**MATERIAL EXAMINED.** Holotype, LACM

11418-2, female 102 mm TL, 91 mm SL, *Eltanin* Stn 1948, 67°33'S, 179°34'W, 3495–3514 m, 3 Feb. 1967. Pect. girdle N 674.

Other material: LACM 11350-1, male, 91 mm TL, 83 mm SL, *Eltanin* Stn 1866, 68°05'S, 173°44'W, 2608–3176 m, 12 Jan. 1967. Pect. girdle N 675. One specimen in the *Eltanin* collections (LACM 11350-1) from off the Balleny Islands may be *C. amplexus*, but it is in poor condition. Its damaged caudal fin, judging from the radiograph, apparently consists of only five rays. Therefore, we do not designate this specimen as a paratype.

**DISTRIBUTION.** The specimens were caught by bottom trawl in the abyssal northern Ross Sea between 2608–3514 m.

**ETYMOLOGY.** The specific epithet is from the Latin “amplus,” large, and “caput,” head, denoting the large size of the head.

**COMMENTS.** *Careproctus amplexus* is similar to the South Georgian *C. improvisus* in its large pores and main counts but differs in its longer gill slit reaching ventrally in front of 8–9 rays (vs completely above pectoral base in *C. improvisus*), larger and laterally compressed head (34.1 vs 27.6% SL), smaller ventral disk (7.7 vs 11.0% SL), larger mouth (maxillary reaching to below posterior part of eye vs not reaching to below eye), and small pore-like nostril (vs tubular). *Careproctus amplexus* is also similar to *C. acifer* in having small needle-like prickles and large mandibular pores but clearly differs in the much longer gill slit (12.4 vs 7.4% SL) in front of 8–9 rays (vs completely above P base), larger head (34.1 vs 25.9% SL) and longer predorsal length (36.8 vs 29.4% SL). The hypural and parhypural are fused in *C. amplexus*, unfused in *C. acifer*.

### *Careproctus catherinae* n. sp.

Figure 6

**DIAGNOSIS.** V 46–47 (11+35–36), P 37–38, C 14 (2+5/7), radials 4 (3+1), upper three notched. Two pair of well-developed pleural ribs. Hypural plate divided, a distinct parhypural suture present. Teeth with shoulders and sharp recurved points. Gill slit long, oblique, 11–12% SL; head 30–33%, preA 45–50%, disk 13% SL. Peritoneum pale.

**DESCRIPTION** [Paratype]. *Counts:* D 43 [43], A 34 [34], P 38 [37], C 14 [14], V 46–47, radials 4, gr 9 (9), pores 2-6-7-1, pc 12. *Ratios:* Head 30.7 [32.4] percent SL, its width 24.6 [26.0], bd 29.4 [26.2], bdA 23.8 [20.5], preA 49.7 [44.9], disk 13.1 [13.1], md 11.5 [11.8], ma 26.7 [28.1], da 4.1 [4.3], aAf 13.4 [12.8], UPL 19.0 [17.6], NL 9.5 [8.0], LPL 16.9 [17.9], eye 4.6 [5.2], sn 8.6 [8.4], io 11.6 [12.5], gill slit 11.6 [11.2], UPL 62.1 [55.2] HL, disk 42.8 [40.3], eye 15.2 [5.9], sn 28.1 [25.7], io 37.9 [38.5], gs 37.9 [34.5].

Head large, its width slightly shorter than its depth. Upper head contour evenly rounded to slightly projecting snout. Mouth large, terminal, horizontal; maxillary extending posteriorly to be-



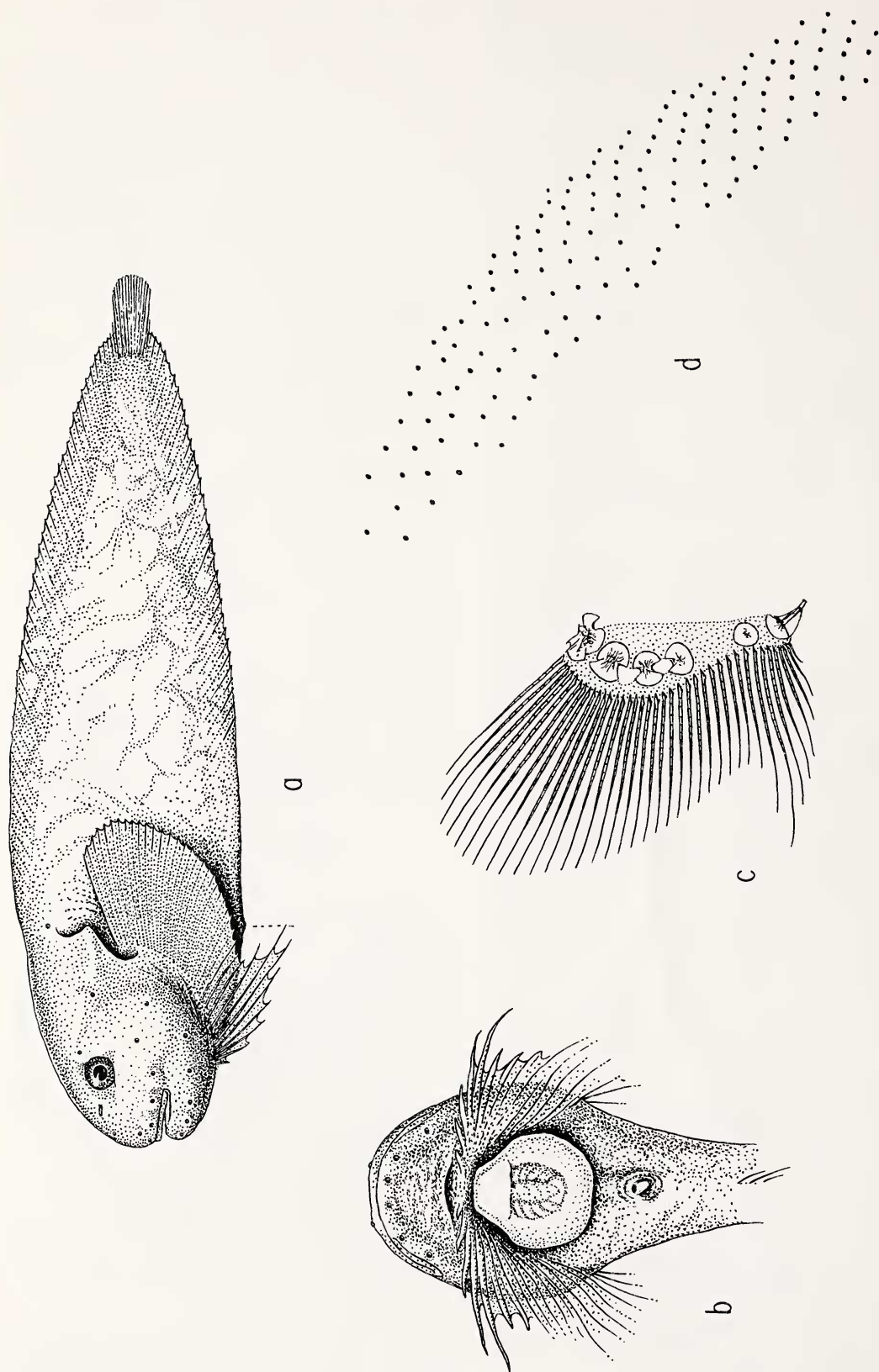


Figure 6. *Careproctus catharinae* n. sp. Holotype, LACM 11398-2, 189 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

low middle or rear of eye. Upper and lower lips fringed by dense cutaneous papillae. Teeth simple, conical, partly recurved; larger (inner) teeth with rounded or orthogonal shoulders or small lateral lobes. Tooth bands rather wide, at widest about 18–19% length of band (Fig. 6d); symphyseal gap absent. Eye small, pupil about half eye diameter. Nostril pore-like with raised rim. Cephalic pores small, round, contoured. Symphyseal mandibular pore interspace (pm 1–pm 1) about equal to interspace pm 1–pm 2 (Fig. 6b). Postorbital pore (t 1) and upper preoperculumandibular pore (pm 7) rudimentary. Suprabranchial pore single, small, with raised rim. Gill slit long; dorsally even with upper part or middle of eye, extending obliquely down in front of 5–6 pectoral rays. Opercular flap small, at gill slit dorsal end.

Pectoral fin not quite reaching anal fin origin, notch moderately deep, distinct. Rays becoming shorter ventrally to 27th–29th, which are of similar length and half as long as upper P lobe. Lower P lobe of 9 rays, the longest (seventh to eighth from bottom) nearly equal to upper P lobe. Lowest pectoral ray origin below anterior margin of eye. Pectoral girdle in both specimens typical of *Careproctus* sensu strictu (as in *C. reinhardti* Krøyer 1862, e.g., notched radials, pleural ribs, etc.). Basal cartilaginous lamina with four radials, upper three and scapula notched, separated by three interradiar fenestrae (Fig. 6c). Scapular helve short and wide; coracoid helve long, narrow, with lamellar plates only near base; small foramen present.

Body trunk large, deep, not attenuated. Anterior two dorsal ray interneurals between third and fourth neural spines. Parapophyses of 10th and 11th vertebrae with long, rather thin pleural ribs directed posteriorly then curving ventrally. Abdominal vertebrae 11, caudal 35 [36]. Disk flat, large. Margin wide, plain, forming a large anterior lobe with a slightly flattened anterior outline. Anus located about two-thirds of distance from tip of mandible to anal fin origin. Preurostylar vertebra deformed in holotype, normal in paratype. Last dorsal and anal rays based on first preurostylar vertebra reaching beyond (D) or not quite to (A) middle of caudal fin. Hypural plate widely divided; lower half distinctly shows suture or line of contact with parhypural. Caudal fin of 14 (2+5/7) rays in both specimens. Ventral caudal ray based on parhypural. Skin smooth, thin, loose. Pyloric caeca in two groups (7+5), unequal in size, digitate, and elongated.

Color in alcohol pale but was “pink to lavender” (Tompkins 1977:52). Stomach, peritoneum, orobranchial cavity, and gill arches bearing rakers pale.

**MATERIAL EXAMINED.** Holotype, LACM 11398-2, male, 216 mm TL, 189 mm SL, *Eltanin* Stn 1925, 75°07'S, 175°51'W, 1382–1405 m, 27 Jan. 1967. Pect. girdle N 668. Paratype, ZISP 50835 (formerly LACM 11399-4), female, 192 mm TL, 176 mm SL, *Eltanin* Stn 1926, 74°53'S,

174°42'W, 2148–2154 m, 22 Jan. 1967. Pect. girdle N 669.

**DISTRIBUTION.** The two known specimens were caught with a bottom trawl (10-foot Blake trawl) in the northern Ross Sea between 1382 and 2154 m. The male (holotype) is probably partly spent; the female (paratype) is unripe, with small homogeneous oocytes less than 1.0 mm diameter.

**ETYMOLOGY.** The species is named in honor of Dr. Catherine Ozouf-Costaz, MNHN Paris, for her pioneer caryotaxonomic studies of Antarctic notothenioid fishes.

**COMMENTS.** Despite deformation of the preural vertebra in the holotype, that specimen was designated because it is larger and generally better preserved than the paratype.

*Careproctus catherinae* is a typical rib-bearing species of *Careproctus* except that it has a distinct parhypural. No other species in this group has such a hypural. It is similar to *C. smirnovi* (Falkland Is, 1500–1580 m) in general appearance and counts, but it differs distinctly in the shorter gill slit (in front of 5–6 P rays and 34.5–37.9% HL vs in front of 14–17 rays and 46.7–50.0% HL), much larger disk (40.3–42.8% vs 30.4–32.6% HL), well-developed tooth shoulders and unpigmented peritoneum (light brown in *C. smirnovi*). *Careproctus catherinae* is similar to *C. parini* (S. Shetland Islands, 750–860 m), but it is distinct in tooth shape (three distinct sharp lobes in *C. parini*), more pectoral rays (37–38 vs 33–35), shorter distance between disk and anus (13.1–13.3 vs 25.5–32.4% HL), and pale peritoneum (brown in *C. parini*).

### *Careproctus continentalis* Andriashev and Prirodina 1990

Figures 7, 8

*Careproctus continentalis* Andriashev and Prirodina 1990a:8, figs. 4, 5 (NE Weddell Sea). Andriashev and Prirodina 1990b:717, figs. 4, 5 (diagnosis, in key). Duhamel 1992:186, fig. 1a (NE Weddell Sea, 425–515 m).

**EXPANDED DIAGNOSIS.** D 44–47, A 40–42, P 25–28, C 10 (11) [1+4/5(6)], V 50–52 (8–9+42–44), gr 4–6, rad 3 (2+0+1), all round. Scapula without helve (Fig. 7c), pleural ribs absent. Hypural plate single, unsplit. Teeth simple, sharp. Mouth terminal, horizontal. One suprabranchial pore. Symphyseal mandibular pores small, spaced. Pectoral fin moderately notched. Pyloric caeca absent. Gill slit small, above pectoral base, 3.0–4.8% SL; head 22–25%, preA 33–38%, disk 8.1–10.3%. Body, orobranchial cavity, peritoneum and stomach pale. Maximum length (TL) to 69.4 mm.

Measurements and counts from MNHN 1991-355: *Counts:* D 47, A 42, P 27, C 10 (1+4/5), V 52 (9+43), gr 6, rad 3 (2+0+1); pc absent. *Ratios:* Head 23.4% SL, its width 14.5, bd 15.3, bdA 12.9, preA 36.5, disk 8.1 (34.5% HL), md 11.8, ma 14.3, da 3.5 (24.7), aAf 13.7, UPL 21.0 (90.0), NL

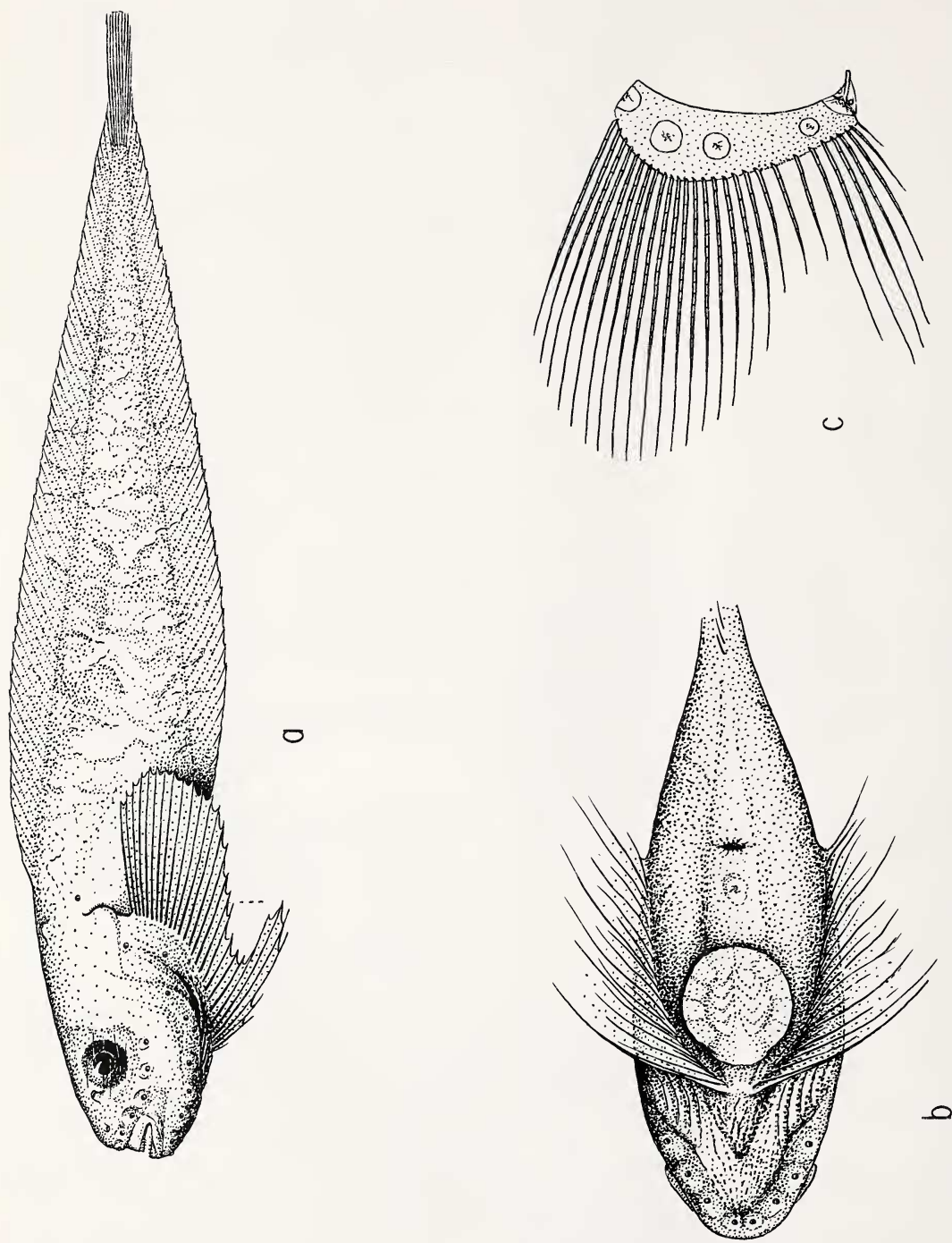
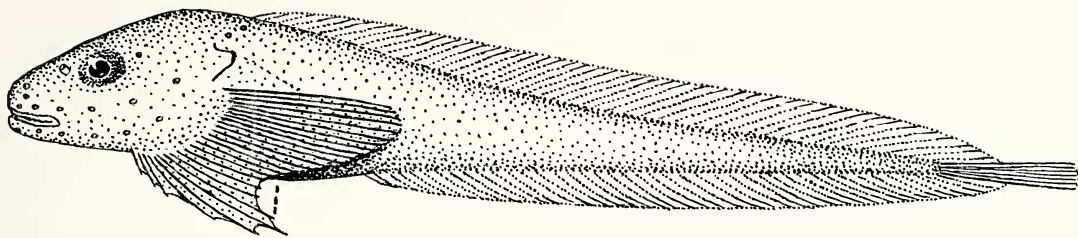
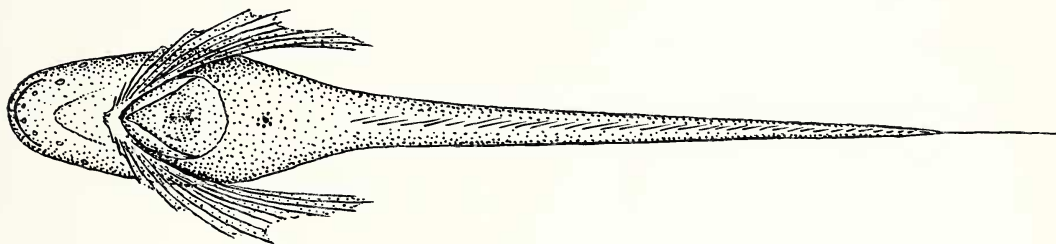


Figure 7. *Careproctus continentalis* Andriashev and Prirodina. Topotype, MNHN 1991-355, 62 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.





a



b

Figure 8. *Careproctus continentalis* Andriashev and Prirodina. Paratype, ZISP 49346, juvenile, 41.5 mm SL: a, lateral view; b, ventral view.

8.4, LPL ca 16, eye 5.6 (24.7), sn 6.1, io 7.3, upper jaw 6.4, gs 3.2 (13.8).

Duhamel (1992) recorded counts of D 44–48, A 40–42, P 26–27, V 50–52 for four specimens.

**MATERIAL EXAMINED.** Holotype, ISH 59-85, juvenile, sex unknown, 50 mm SL (74 mm SL in original description is an error). Pect. girdle N 503. *Polarstern* Stn 273, 72°35'S, 18°07'W, 552 m, 27 Jan. 1985, Coll. W. Ekau. Paratype, ZISP N 49346, juvenile, SL 34 mm. Pect. girdle N 504. Caught with holotype. Other specimens: ISH 99-85, juveniles, SL 48.5, 41.5, 41 mm, *Polarstern* Stn 330, 72°28'S, 17°39'W, 600 m, 15 Feb. 1985, Coll. W. Ekau. MNHN N 1991-355, 2 females, 62 mm SL, Camp. "Epos III," Stn 291GSN14, 71°06'S, 12°34'W, 499–515 m, 19 Feb. 1989, Coll. G. Duhamel.

**DISTRIBUTION.** *Careproctus continentalis* has been repeatedly caught in bottom trawls on the northeastern shelf of the Weddell Sea (from 71°06' to 73°07'S) at a depth of 425–600 m.

**ETYMOLOGY.** "Continentalis" because this was the first species of *Careproctus* found on the Antarctic continental shelf.

**COMMENTS.** *Careproctus continentalis* is closely related to *C. steini* from the South Shetland

Islands, but differs in having fewer pectoral rays (25–28 vs 31–32), in the more widely spaced mandibular symphyseal pores, in the absence of peritoneal pigmentation, and probably in having a more slender body (15–20 vs 21–25% SL).

### *Careproctus credispinulosus* Andriashev and Prirodina 1990

Figure 9

*Careproctus credispinulosus* Andriashev and Prirodina 1990b:710, figs. 1, 2A (South Georgia).

**EXPANDED DIAGNOSIS.** D 46–50, A 41–44, P 34–35 (25–27+8–10), C 12 (11) (0–1+5/5+1), V 50–54 (8–9+42–45), rad 4 (3+1), all round. Pc 7–10, elongate, about 12% SL. Pleural ribs present, hypural plate with a slit. Mouth terminal, teeth shouldered or weakly trilobed. Suprabranchial pores two, symphyseal mandibular pores closely set. Gill slit about above P base. Pectoral fin distinctly notched, notch rays not rudimentary. Body covered with small thumb-tack prickles (round base, diameter 0.3–0.4 mm). Anus just behind disk. Head about 28–30 (34)% SL, preA 45%, disk 6.3–7.6%. Body pale, orobranchial cavity light, peritoneum brown. Total length to 80 mm.

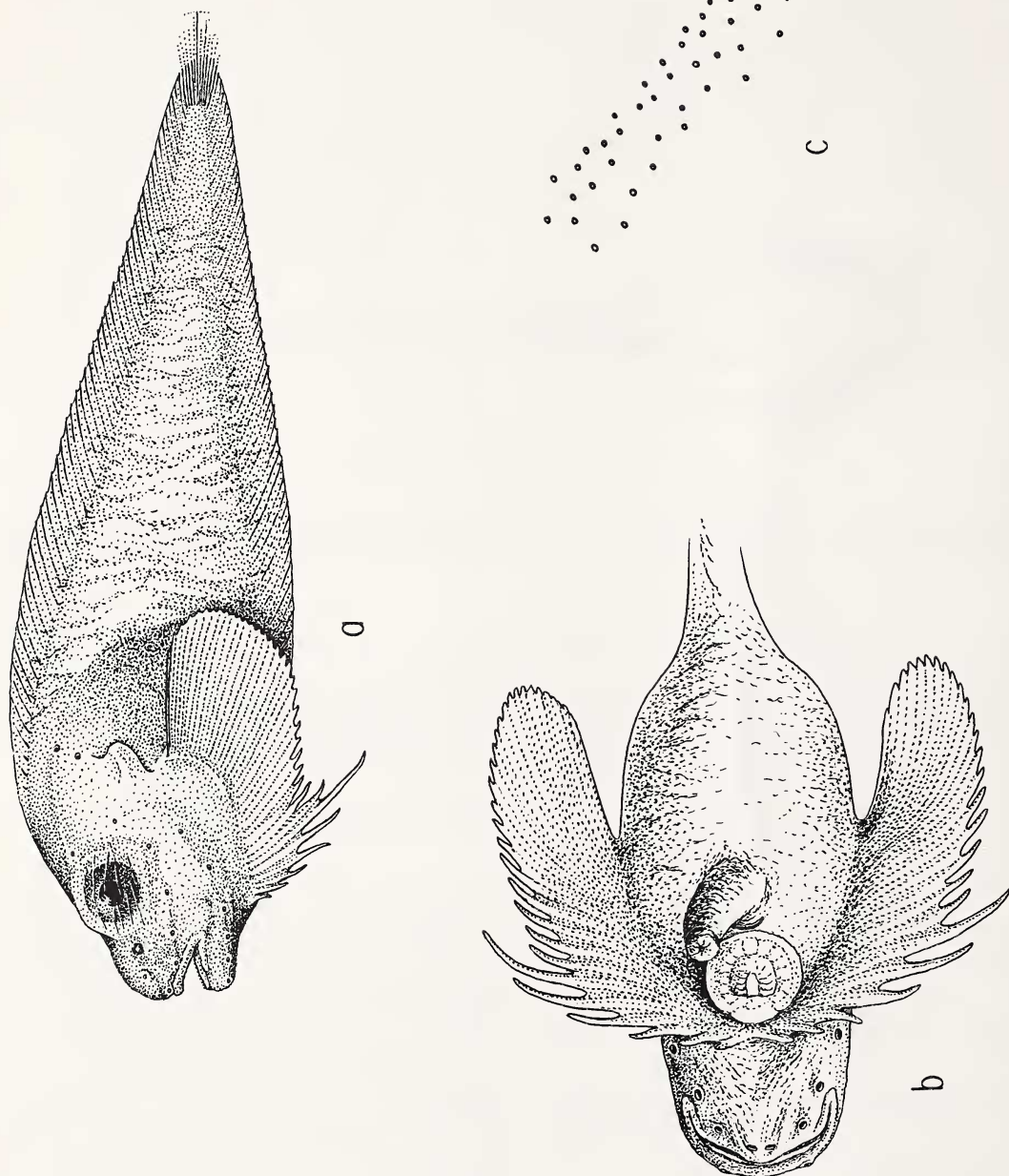


Figure 9. *Careproctus credispinulosus* Andriashev and Prirodina. Holotype, ISH 336-76, 73.5 mm SL: a, lateral view; b, ventral view; LACM 10606-2; c, premaxillary tooth pattern.

Counts and ratios from LACM 10606-2 (n = 4): Counts: D 46–50, A 41–43, P 34–35, C 12 (11), V 50–53, rad 4, pc 9–10, pores 2–6–7–2. Ratios: 48–53 mm SL: Head 28.2–30.0 (34.1)% SL, head width 14.7–19.6, bd 23.9–25.1, disk 6.3–7.6, md 12.3–15.9, ma 17.7–25.6, da 1.9–2.7, aAf 20.8–21.0, UPL 18.4–25.1 (64–71), LPL 17.8–20.0, eye 6.7–8.1 (24–29), sn 9.0–10.7, maxillary 12.7–14.1, mandible 11.2–12.9, gs 8.6 (30).

**MATERIAL EXAMINED.** Holotype, ISH 336-76, female, ca 80 mm TL, 72 mm SL, *Walther Herwig* Stn 33, 53°56'S, 35°40'W, 800 m, 11 Dec. 1975, Coll. G. Krefft. Paratype, ZISP 49539, male juv., 49 mm SL, caught with holotype. Other specimens: LACM 10606-2, 6 young specimens SL 37.5–60 mm, *Eltanin* Stn 731, 53°34'S, 36°47'W, 796–824 m, 12 Sept. 1963. LACM 10608-1, female, 48 mm SL, *Eltanin* Stn 734, 53°23'S, 37°11'W, 1299–1400 m, 12 Sept. 1963.

**DISTRIBUTION.** Off South Georgia Island between 796–1400 m. The holotype has 45 eggs about 2.5 mm diameter and smaller reserve oocytes.

**COMMENTS.** *Careproctus credispinulosus* differs from all known Antarctic species of *Careproctus* in the presence of two suprabranchial pores and numerous small thumb-tack prickles. *Careproctus credispinulosus* differs from both allopatric South Georgian species, *C. georgianus* and *C. improvisus*, in the presence of pleural ribs (vs absent), a slit hypural plate (vs unslit), shouldered or slightly trilobed teeth (vs simple), and more numerous caudal fin rays (12 vs 9–10). *Careproctus georgianus* further differs from *C. credispinulosus* in having a short, flattened head (vs laterally compressed), tubercle-like pyloric caeca (vs elongate), a pale peritoneum (vs brown), and shallower habitat (88–285 m vs 796–1400 m). *Careproctus improvisus* is easily distinguished in having fewer vertebrae (48 vs 54), fewer pectoral fin rays (26 vs 35) and shorter pyloric caeca (3.5 vs 12% SL).

### *Careproctus eltaninae* n. sp.

Figure 10

**DIAGNOSIS.** V 48 (9+39), P 25, C 9 (4/5+rud.), radials 2, round, opposed, closely spaced. Pleural ribs absent, hypural plate single, unslit. Mouth terminal, teeth simple, sharp. Mandibular pores small, symphyseal pores spaced. Gill slit extending ventrally in front of 4–5 rays, about 11% SL; HL 28.7%, preA 33.3%, disk 10.6%. Orobranchial cavity pale, peritoneum dark brown.

**DESCRIPTION.** Counts: D 42, A 36, P 25, C 9, V 48, radials 2, pc 10, pores 2–6–7–1, gr 10. Ratios: Head 28.7% SL, its width ca 18, bd 22.8, bdA ca 15, preD 27.8, preA 33.3, disk 10.6 (37.0% HL), md 13.4, ma 28.4, da 6.0, aAf 13.4, UPL 23.7 (83), LPL 23.4, NL ca 6, eye 4.5 (15.6), sn 7.5, gs 10.9 (39).

Head moderately large, cheeks vertical. Dorsal contour of head gently sloping from occiput to

slightly protruding tip of ascending processes of premaxillae; lateral to each is a skin tubercle of unclear nature. Snout blunt, tipped by the nearly vertical ascending processes of premaxillae. Mouth terminal, horizontal, upper jaw extending posteriorly to below middle of eye, mouth cleft to below anterior margin of eye. Tongue covered with small prickle-like papillae. Teeth in both jaws simple, rather slender, sharp, in many indistinct oblique rows of 3–5 teeth each near premaxillary symphysis (Fig. 10d). Maximum width of tooth band 10–11% of its length. Premaxillary symphyseal gap present, narrowing towards inside of mouth; mandibular gap absent. Eye small, nostril pore-like. Pores of infraorbital canal moderately large, contoured; the two anterior pores round, the next two more oval, fourth below middle of eye. Mandibular pores oval, pm 1–1–pm 1–2 widely spaced. Suprabranchial pore small, distinctly higher, and slightly anterior to dorsal end of gill slit. Gill slit moderately long, rather oblique, origin level with mid-eye and extending ventrally in front of 4–5 P rays. Opercular flap notably extending above P base, with rounded tip. Gill rakers 10.

Uppermost pectoral fin ray on horizontal with oral cleft. Fin deeply notched, its rays progressively shorter ventrally to 19th ray, length of which equals about a quarter of upper lobe length. Lower lobe of six rays, the longest (fifth from bottom) about equal to upper lobe length. Interspaces between all fin rays similar. Pectoral rays 25 (19+6). Basal cartilaginous lamina of pectoral girdle wide except for narrow lower quarter. Radials two, round, large, 1+0+1; dorsal radial below scapula, ventral above coracoid; interspace between radials short, equal to diameter of one radial (Fig. 10c). Scapular helve narrow; coracoid with foramen and long straight helve framed by sloping lateral ribs.

Body moderately elongate, preanal distance 33% SL. Disk moderately large, nearly round, anterior lobe poorly developed. Marginal ring smooth, not sculptured by sectors, slightly narrower than diameter of disk center. Distance of mandible from disk equal to that between anus and anal fin origin. Interneural of first dorsal ray between fourth and fifth vertebrae. Pleural ribs absent; epipleural ribs short, occurring only on several trunk vertebrae. Parapophyses of seventh vertebra connected, not forming a haemal spine; parapophyses of eighth and ninth vertebrae forming short haemal spines; haemal spine of 10th vertebra supporting interneural of first anal fin ray. Preurostylar vertebra supporting terminal D and A fin rays; rays about one-half overlapping caudal fin. Hypural plate unslit. Caudal fin of 9 (4/5) principal rays; one ventral procurent rudiment.

Skin thin, moveable; prickles absent. Pyloric caeca about 10, short, the last 3 connected together at bases.

In alcohol, body, orobranchial cavity, and stomach pale, peritoneum dark brown.

**MATERIAL EXAMINED.** Holotype, LACM



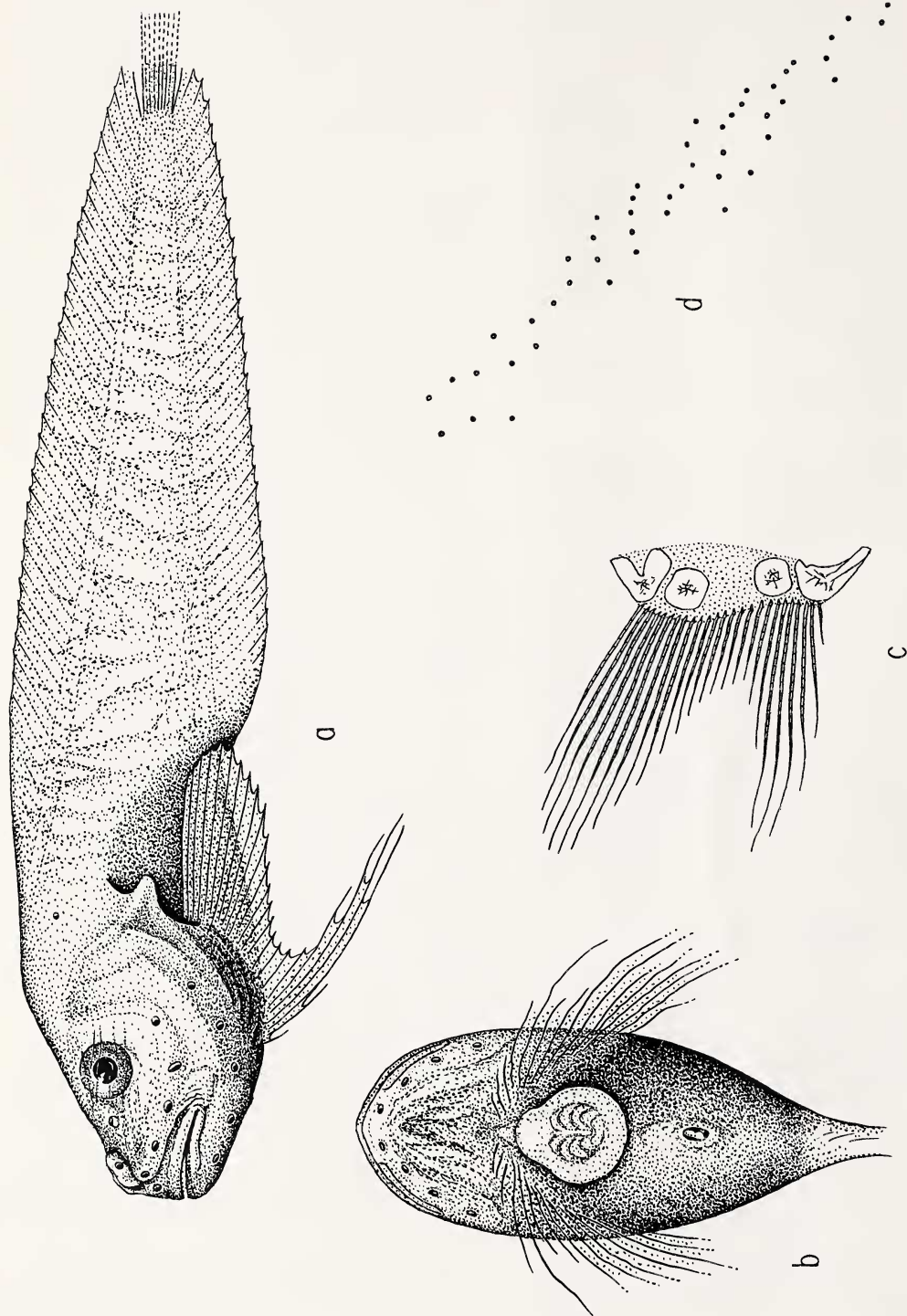


Figure 10. *Careproctus eltaninae* n. sp. Holotype, LACM 11062-2, 67 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

11062-2, male, 71 mm TL, 67 mm SL, *Eltanin* Stn 1585, 56°11'S, 38°36'W, 2869–3038 m, 9 March 1966. Pect. girdle N 682.

**DISTRIBUTION.** The only known specimen was collected by bottom trawl in the northern Scotia Sea, south of South Georgia Island between 2869–3038 m.

**ETYMOLOGY.** Named in honor of the USNS *Eltanin*, research vessel of the United States Antarctic expedition, which made possible many years of successful biological investigations in the Southern Ocean.

**COMMENTS.** The holotype is an immature male in rather good condition except for damaged interorbital space and broken lower jaw. *Careproctus eltaninae* is in the ribless group of Antarctic deep-sea *Careproctus* having only two oppositely arranged pectoral radials (*C. acifer*, *C. ampliceps*, *C. leptorhinus*, *C. pseudoprofundicola*, and others). It differs from them in having only a short distance between the two radials (1+0+1 instead 1+0+0+1). In counts, *C. eltaninae* is similar to *C. acifer*, but the latter has an oblique mouth, shorter gill slit (7.4 vs 10.6% SL), and many small crater-like pits with needle-like prickles. *Careproctus eltaninae* is also similar in counts to *C. ampliceps*, but the latter has a distinctly larger head (34.1 vs 28.7% SL), smaller disk (20.3 vs 37.0% HL), larger circumoral pores, longer preanal distance (41.8 vs 33.3% SL), and many small deciduous needle-like prickles. *Careproctus leptorhinus* is easily distinguished from *C. eltaninae* by its distinctly trilobed teeth, tubular nostril, more numerous vertebrae (55 vs 48), inferior mouth, shorter gill slit, and more elongated body. *Careproctus pseudoprofundicola* has a longer pectoral fin (exceeding head length), more oblique gill slit, and narrower premaxillary tooth band (width 3–4 vs 10–11% tooth band length).

### *Careproctus falklandicus* (Lönnberg 1905)

Figure 11

*Liparis antarctica* Putnam n. subsp. (?) *falklandica* Lönnberg 1905:117, pl. III, fig. 12 (Falkland Islands, 16 m; Burdwood Bank, 137–150 m).

*Careproctus falklandica* Norman 1937:130, fig. 73 (Strait of Magellan, 21–23 m).

*Careproctus falklandicus* Andriashev 1990b:6, fig. 1 (redescription after syntypes; designation of lectotype). Stein et al. 1991 (description of Norman's specimens).

**EXPANDED DIAGNOSIS.** D 34–36, A 27–30, P 29–31, C 11–12 (1+5/5+0–1), V 38–40 (9–10+29–30), radials 4, round, equidistant, pc 11–16, pores 2-6-7-2, gr 5–7. *Ratios* (for lectotype): Head 33.4% SL, its depth and width about 23, bdA 20.7, preD 31.8, preA 50.8, disk 13.5 (40.4% HL), md 11.9, ma 27.0, aAf 22.3, UPL 19.9 (59.5), NL 10.3, LPL 16.7, E 5.2 (15.7), sn 12.0(36), io 12.7 (38), uj 8.4 (25.3), gs 6.5 (19.5).

Pleural ribs absent, hypural plate divided. Head

large, mouth small, inferior; teeth tritubercular. Mandibular symphyseal pores small, closely spaced; suprabranchial pores two. Skin covered with minute prickles. Disk distinctly sculptured by segment tubercles. Anus just behind disk. Pectoral fin fan-shaped, slightly notched. Body color pale, pale orange in life (Norman 1937). Orobranchial cavity and peritoneum unpigmented. The female 98 mm TL from Burdwood Bank was swollen with ripe eggs 2.3 mm diameter.

**MATERIAL EXAMINED.** Three specimens from three stations. Lectotype, NRM 1902.375.7320, female, 73 mm TL, 63 mm SL, Schwed. Südpolar. Exp., Stn 59, 53°45'S, 61°10'W, Burdwood Bank, 137–150 m, 12 Sept. 1902. Pect. girdle N 509, radiograph N 16673. Paralectotype, NRM 1902.296.6320, male, 44 mm TL, 38 mm SL, Schwed. Südpolar. Exp., Stn 40, Falkland Islands, Berkeley Bay, 16 m, 19 July 1902. Pect. girdle N 508, radiograph N 16677. Additional material, ISH 233-78, female, 98 mm TL, 84 mm SL, *Walther Herwig* Stn 588/78, 54°08'S, 61°15'W, 125–120 m, 28 May 1978.

**DISTRIBUTION.** Burdwood Bank (120–150 m), Strait of Magellan (21–23 m), Falkland Islands (16 m).

**COMMENTS.** *Careproctus falklandicus* is most closely related to a poorly known group of species that includes *C. pallidus* (Vaillant 1888) and *C. crassus* DeBuen 1961. It differs from both species in the more numerous dorsal and anal fin rays (D 34–36, A 27–30 vs D 30–31, A 25–26) and vertebrae (38–40 vs 35–36 in three syntypes of *C. pallidus*; Stein et al. 1991).

### *Careproctus fedorovi* n. sp.

Figure 12

**DIAGNOSIS.** V 47 (8+39), P 28, C 9 (1+4/4), radials 2, round, opposed (1+0+0+1). Pleural ribs absent, hypural plate single, unslit. Head low, its depth 16.7% SL. Mouth terminal, teeth simple. Gill slit above P base. Pyloric caeca absent. Head 26.3% SL, preA 39.0%, disk 8.4%. "Body dark dusky" (Tompkins 1977:89), peritoneum brown-black.

**DESCRIPTION.** *Counts:* D 42, A 37, P 28, C 9, V 47, radials 2, pores 2-6-7-1, gr 7. *Ratios:* Head 26.3% SL, depth and width 15.6, preA 39.0, disk 8.4 (32.0% HL), md 10.4, ma 20.8, da 3.6 (13.8), aAf 15.6, UPL 20.3 (77), notch ray ca 5.5, LPL 19.0, eye 4.2 (15.8), sn 8.4, upper jaw 11.4 (43.3), gs 6.5 (24.6).

Head moderately large and low, its depth and width about one-sixth SL, dorsal outline smoothly sloping to low, unprojecting snout. Mouth terminal, horizontal, upper jaw extending to slightly behind anterior margin of eye. Teeth simple, slender, weakly sharpened, maximum width of premaxillary tooth band about 14–15% of its length (Fig. 12d). Symphyseal gap absent from both jaws. Eye small, pupil not enlarged. Nostril pore-like with raised rim. Upper nasal pore (n 2) large, circumoral

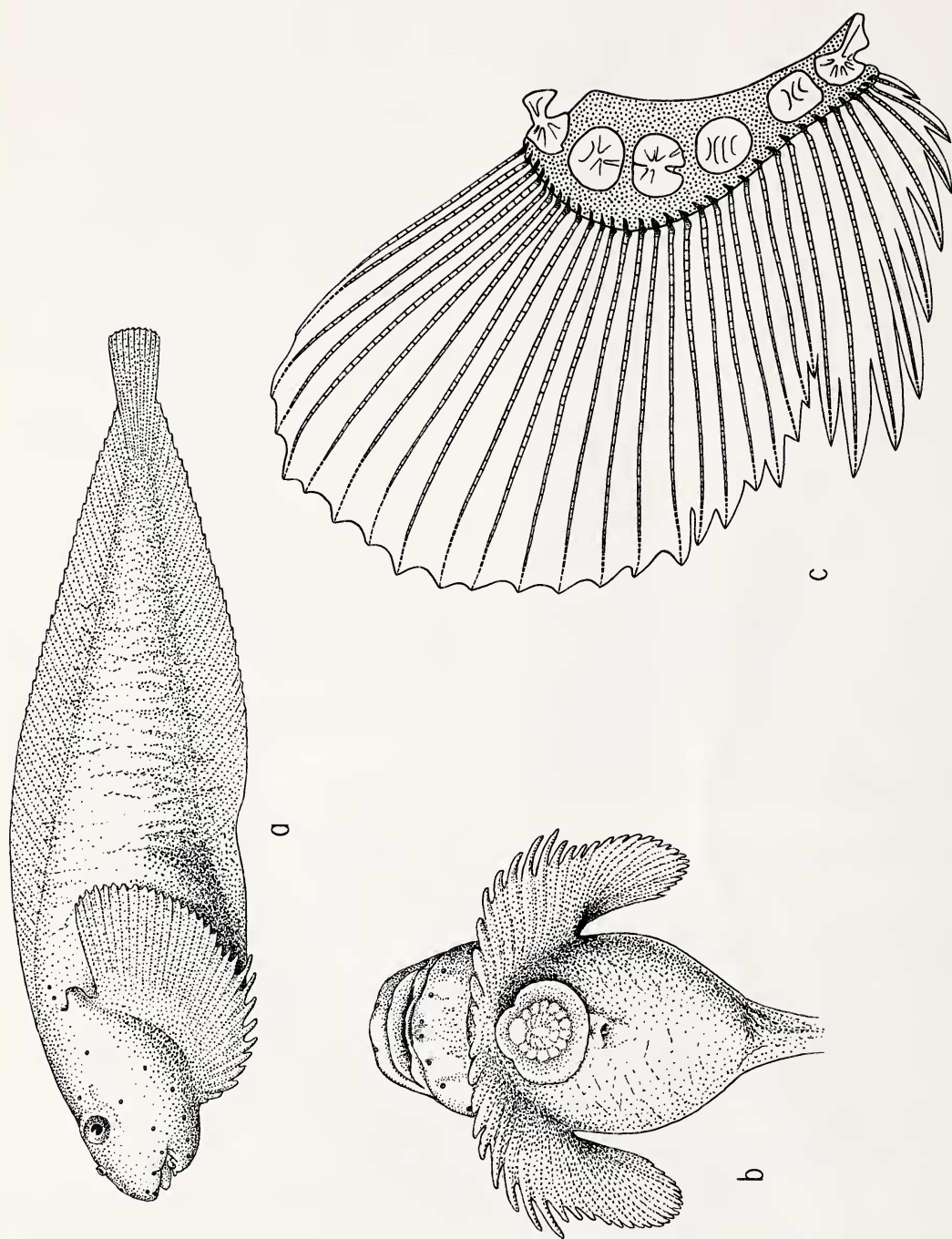


Figure 11. *Careproctus falklandicus* Lönnberg. Lectotype, NRM 1902.375.7320, 63 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.



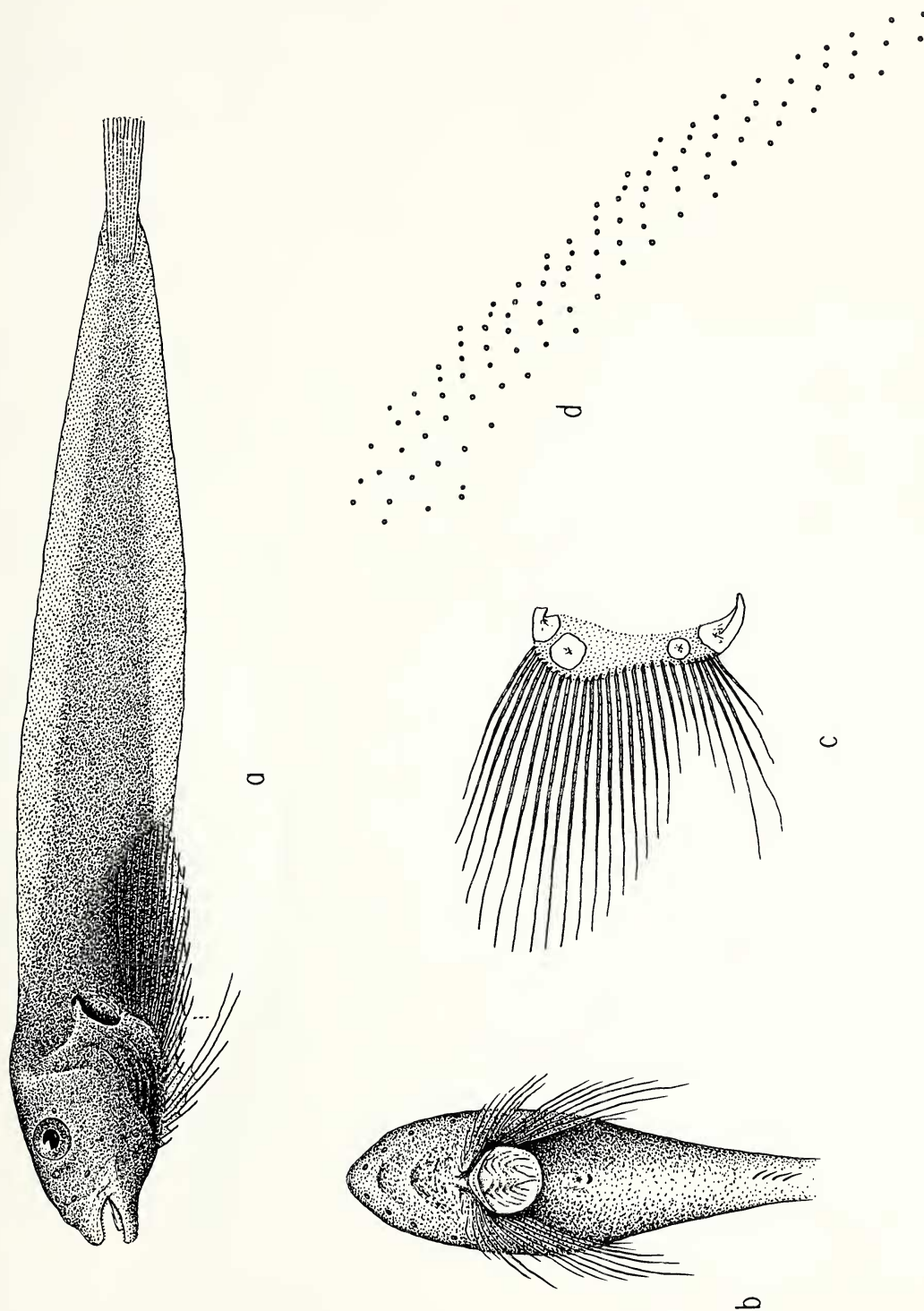


Figure 12. *Careproctus fedorovi* n. sp. Holotype, LACM 10747-12, 77 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

pores moderate, round to oval. Distance between mandibular symphyseal pores (pm 1–pm 1) a little shorter than pm 1–pm 2. Suprabranchial pore single, small, its distance from dorsal end of gill slit equal to diameter of eye. Gill slit completely above P base, its length equal to 25% HL. Operculum small, opercular flap at dorsalmost part of gill slit.

Pectoral fin of 28 rays (20+8, lowest rudimentary), notch moderate, low. Dorsalmost ray slightly below level of maxilla posterior. Upper pectoral fin lobe extending to slightly behind anal fin origin; rays shortened ventrally to 20th ray, length of which is one-fourth upper lobe length. Lower P lobe of eight rays with free tips (counting the lowest, rudimentary, ray which is discernible by clearing and staining). Basal cartilaginous lamina with two round radials, one below scapula, second above coracoid (1+0+0+1). Interradial fenestrae absent.

Body tapering postabdominally, attenuate; depth two-thirds head length. Skin without prickles; subcutaneous layer weakly developed. Disk moderately large, round, with narrow margin folded over anterior of disk; anterior lobe not developed (Fig. 12b); diameter of disk slightly less than one-third head length; center large, covered with thin skin, rays visible. Interspace between disk and anus less than half disk diameter. Pleural ribs absent. Abdominal vertebrae few (8). Hypural plate single, unslit. Caudal fin of 8 (4/4) principal rays and 1 dorsal procurent ray. Preurostilar vertebra bearing posterior ray of dorsal and anal fins. Interneural of the first dorsal ray between fifth and sixth neural spines. Pyloric caeca absent.

Body of the holotype in alcohol is rather dark; body "dark dusky" (Tompkins 1977:89). Orobranchial cavity pale, peritoneum brown-black; stomach light.

The holotype is a ripe female with eggs up to 4.6 mm, in addition to unripe oocytes less than 1 mm.

**MATERIAL EXAMINED.** Holotype, LACM 10747-12, female, 88 mm TL, 77 mm SL, *Eltanin* Stn 1509, 58°57'S, 54°07'W, 3817–3931 m, 25–26 Jan. 1966 Pect. girdle N 684.

**DISTRIBUTION.** The holotype was caught by bottom trawl at abyssal depths (3817–3931 m) of the southwestern Scotia Sea.

**ETYMOLOGY.** The new species is named after V.V. Fedorov in recognition of his extensive studies of North Pacific fishes, including liparids.

**COMMENTS.** *Careproctus fedorovi* was caught with *C. lacmi* but differs from it in the more elongated body and shallower head (15.6 vs 26.2% SL), in the smaller disk (8.4 vs 13.0% SL), absence of pyloric caeca (vs 10), wider premaxillary tooth band (14–15 vs 8–9% of band length), fewer and differently arranged pectoral radials (1+0+0+1 vs 2+0+1), and in the darker peritoneum (brownish black vs light brown).

## *Careproctus georgianus* Lönnberg 1905

Figure 13

*Careproctus georgianus* Lönnberg 1905:41, pl. III 11a–d (Cumberland Bay, South Georgia, 195 m). Burke 1930:122 (sec. Lönnberg). Norman 1938: 86, fig. 57 (South Georgia, 88–273 m). Stein and Andriashev 1990:233, fig. 4 (diagnosis after syntypes). Andriashev and Prirodina 1990b:713, fig. 2 (short redescription; embryos).

**DIAGNOSIS.** V 56–60 (8–9+47–51), P 29–34, C 10 (1+4/5), radials 4, all round, equidistant. Pleural ribs absent, hypural plate single, unslit. Head usually wider than deep. Teeth simple, nail-shaped. Nostril long, tubular. Symphyseal mandibular pores smaller than other pores, close together. Gill slit short, completely above P. Pectoral fin fan-shaped, barely notched. Caeca 4, tubercle-like. Head 22–25% SL, preA 35–39%, disk 7–8%. Orobranchial cavity and peritoneum pale.

**DESCRIPTION.** *Counts:* D (49) 50–54, A 45–48, P (29) 30–33 (34), C 10, V (54, 55) 56–59 (60), rad 4, pc 4, pores 2-6-7-1, gr 8–10. *Ratios* (from USNM 327893, 327894, 327898, SL 77–90 mm): Head 23.1–25.0% SL, hd width 21.2–22.8, hd depth 17.2–20.1, bd 22.1–23.3, bdA 16.0–18.6, preA 35.1–39.4, disk 7.2–7.9 (30.5–36.9% HL), md 8.4–9.4, ma 15.6–18.0, da 1% or less, UPL 19.5–23.3 (75–101), LPL ca 10–14, E 4.4–4.8 (17.5–20.6), sn 8.9–9.3, io 12–14, gs 5.2–5.3 (20.0–22.7).

Head moderately small, somewhat flattened, usually wider than deep. Dorsal outline of head gently sloping to low snout not projecting beyond upper jaw. Mouth terminal to subterminal, lower jaw included. Upper jaw extending posteriorly to below rear of eye, mouth cleft to front margin of eye. Snout fold wide and thick. Teeth in both jaws simple, small, nail-like, well spaced, forming oblique rows of up to 4–6 teeth at anterior of premaxilla. Symphyseal gap absent in both jaws. Eye small. Nostril with comparatively long tube of constant diameter, on a horizontal through upper margin of eye. Interorbital distance much greater than interspace between nostrils. Seismosensory pores small, round, contoured. First pore of infraorbital canal (io 1) just posterior and dorsal to lower nasal pore (n 1). Suprabranchial pore just above dorsal end of gill slit. Symphyseal mandibular pores smaller than others, closely spaced, their interspace equal to or less than pore diameter, usually opening in a shallow oval pit, existence of which depends on fixation. Gill slit short, completely above pectoral fin. Opercular flap moderately short but distinct, rounded; tubular fold of skin above upper end of gill slit.

Pectoral fin large, fan-shaped, overlapping anal fin origin; pectoral notch weakly developed, especially in juveniles and females. Pectoral fin rays gradually shortening ventrally to 21st or 24th ray, which are only slightly shorter than lower lobe rays. Lowest pectoral fin ray on each side closely

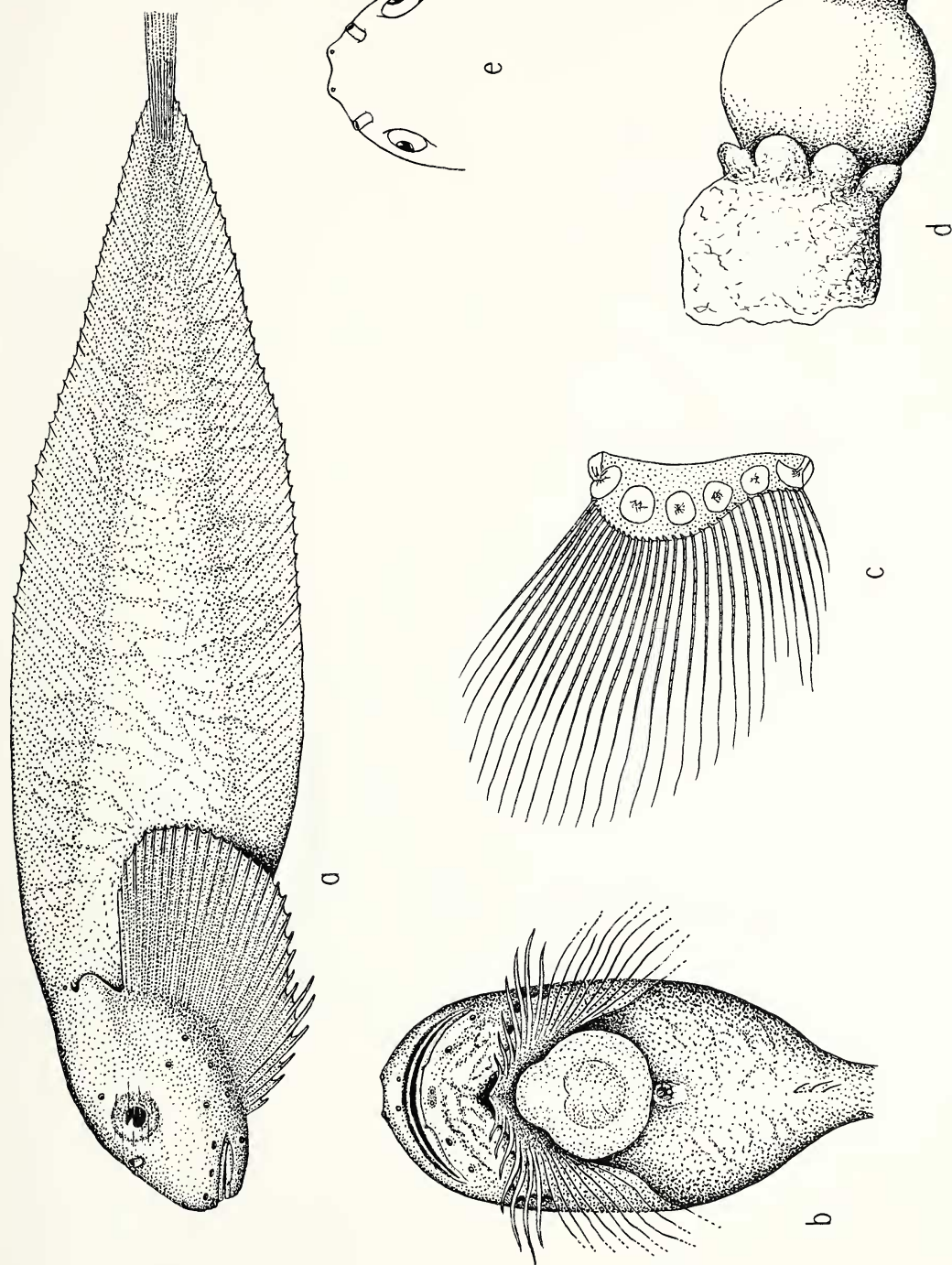


Figure 13. *Careproctus georgianus* Lönnberg. Paralectotype, NRM 1902.296.6320, 86 mm SL: a, lateral view; ZISP 50750 (formerly USNM 327893): b, ventral view; ISH 1022-76: c, pectoral fin and girdle; d, stomach and pyloric caeca. USNM 327894: e, dorsal view of head, showing tubular nostrils.



Table 2. Vertebral, dorsal and anal fin ray counts of *Careproctus georgianus* specimens examined.

|         | vert. (n = 25) |    |    |    |    |    |    | D (n = 22) |    |    |    |    |    |  | A (n = 22) |    |    |    |
|---------|----------------|----|----|----|----|----|----|------------|----|----|----|----|----|--|------------|----|----|----|
| Number  | 54             | 55 | 56 | 57 | 58 | 59 | 60 | 49         | 50 | 51 | 52 | 53 | 54 |  | 45         | 46 | 47 | 48 |
| Adults  | 1              | 1  | 5  | 6  | 2  | 1  | —  | 1          | 2  | 3  | 5  | 1  | 1  |  | 4          | 4  | 1  | 4  |
| Embryos | —              | —  | 2  | 2  | 3  | 1  | 1  | —          | —  | 1  | 3  | 4  | 1  |  | —          | 4  | 4  | 1  |
| Total   | 1              | 1  | 7  | 8  | 5  | 2  | 1  | 1          | 2  | 4  | 8  | 5  | 2  |  | 4          | 8  | 5  | 5  |

set, nearly touching each other (Fig. 13b). Pectoral fin rays (n = 22): 29 (1), 30 (12), 31 (2), 32 (4), 33 (2), 34 (1). Pectoral formula binominal, 21–24+6–9 (10) = 29–34 (modally 30). Pectoral girdle morphology the same in 12 specimens studied. Basal cartilaginous lamina with four round, equidistant, moderately large radials. Scapular helve short; coracoid with foramen and rather short helve.

Body moderately elongated. Preanal distance more than one-third SL. Disk flat or more or less cupped; anterior lobe large, half-round. Marginal ring not sculptured, its edges often turned up after fixation. Anus just behind disk. Pleural ribs absent. Abdominal vertebrae few, 8–9; caudal vertebrae (45) 47–50 (51), total (54,55) 56–59 (60) (Table 2). Boundary between abdominal and caudal vertebrae is distinct. Dorsal rays become shorter anteriorly; first rays rudimentary, gradually more developed posteriorly. Interneural of first D ray between third and fourth or fourth and fifth neural spines. Hypural plate single, unslit. Caudal fin of 10 (1+4/5) rays (n = 22).

Skin thick, naked, prickles absent. Subdermal layer moderately developed. Pyloric caeca four, short or tubercular.

Body white in alcohol, gray or pale orange in life (Norman 1938); orobranchial cavity and peritoneum unpigmented.

**MATERIAL EXAMINED.** Twenty-five specimens (16 juveniles and adults and 9 embryos) from 10 stations. ISH 1022-76, male, 60.5 mm SL, *Walther Herwig* Stn 345/76, 54°14'S, 36°16'W, 103–105 m, 12 April 1976, Coll. K.-T. Kock; ZISP uncat., male, 57 mm SL, *Acad. Knipowitch* trawl 72, 55°08'S, 34°40'W, 135–116 m, 21 April 1981, Coll. A.V. Neyelov and Yu. E. Permitin; ZISP 49541–49544, 7 sp, sexes unknown, 57–95 mm SL, *Prof. Siedlecki*, off South Georgia Island, 162–221 m, Feb.–July 1986, Coll. K. Skura; ZISP 49545, clutch of eggs with embryos, *Acad. Knipowitch* trawl 45, 54°39'S, 34°56'W, 285 m, 8 Aug. 1971, Coll. K.G. Shust; USNM 327893, female, 77 mm SL, *Prof. Siedlecki* Stn 39, 54°121'S, 38°02'W, 153–169 m, 5 Dec. 1986; ZISP 50750 (USNM 327894), female, 86 mm SL, *Prof. Siedlecki* Stn 118, 53°54'S, 37°00'W, 212–237 m, 16 Dec. 1986; USNM 327896, male, 62 mm SL, *Prof. Siedlecki* Stn 71, 54°54'S, 35°49'W, 127–140 m, 9 Dec. 1986; USNM 327897, 59, 69 mm SL, *Prof. Siedlecki* Stn 45, 54°33'S, 37°28'W, 147–153 m, 6 Dec. 1986; USNM 327898, females, 90, 77 mm SL,

*Prof. Siedlecki* Stn 35, 55°40'S, 38°02'W, 167–173 m, 4 Dec. 1986.

**DISTRIBUTION.** *Careproctus georgianus* is common on the South Georgia shelf at 85–285 m; it is probably endemic.

**ETYMOLOGY.** The species name is from its distribution around South Georgia.

**COMMENTS.** No complete redescription of *C. georgianus* has been published since Lönnberg's original description (1905), although specimens have been collected repeatedly. Andriashev and Prirodina (1990b) provided better counts and discussed and illustrated pectoral girdle morphology and pyloric caeca. Therefore in this paper we provide a complete redescription and figures of *C. georgianus* from well-preserved specimens deposited in the National Museum of Natural History.

*Careproctus georgianus* was the first species of *Careproctus* described from the Southern Ocean. Its fan-shaped and scarcely notched pectoral fin is similar to that of *C. falklandicus*, but *C. georgianus* sharply differs from the latter in its simple teeth (trilobed in *C. falklandicus*), single suprabranchial pore (vs 2), more numerous vertebrae (56–60 vs 40), and D and A rays and other characters. *Careproctus georgianus* differs clearly from the sympatric *C. improvisus*; see the latter for discussion.

Adults reach 105 mm TL (Lönnberg 1905); our specimens ranged from ca 70 mm to 102 mm TL. Females 86–94 mm TL caught in December had oocytes 2.5–3.2 mm; those captured in mid-July had eggs to 3.8 mm. Embryos from eggs taken by trawl in August from 285 m were nearly ready to hatch. Embryos were up to 12 mm TL; in some that were cleared and stained with alizarin, vertebrae, fin rays, and branchiostegal rays were completely ossified and the disk was fully formed although the neurocranium was unossified. Eggs probably hatch in late August and September, i.e., in late winter.

*Careproctus improvisus* n. sp.

Figure 14

**DIAGNOSIS.** V 48 (8+40), P 27, C 9 (4/5), radials 3 (2+0+1), round. Pleural ribs absent, hypural plate single, unslit. Mouth terminal, teeth simple. Mandibular pores large, nostril-like, oval, closely set. Gill slit above P base. Anterior lobe of disk enlarged. Head 27.2% SL, preA 40.6%, disk 11.0%. Orobranchial cavities dark, peritoneum black.

**DESCRIPTION.** *Counts:* D 45, A 38, P 27, C 9,

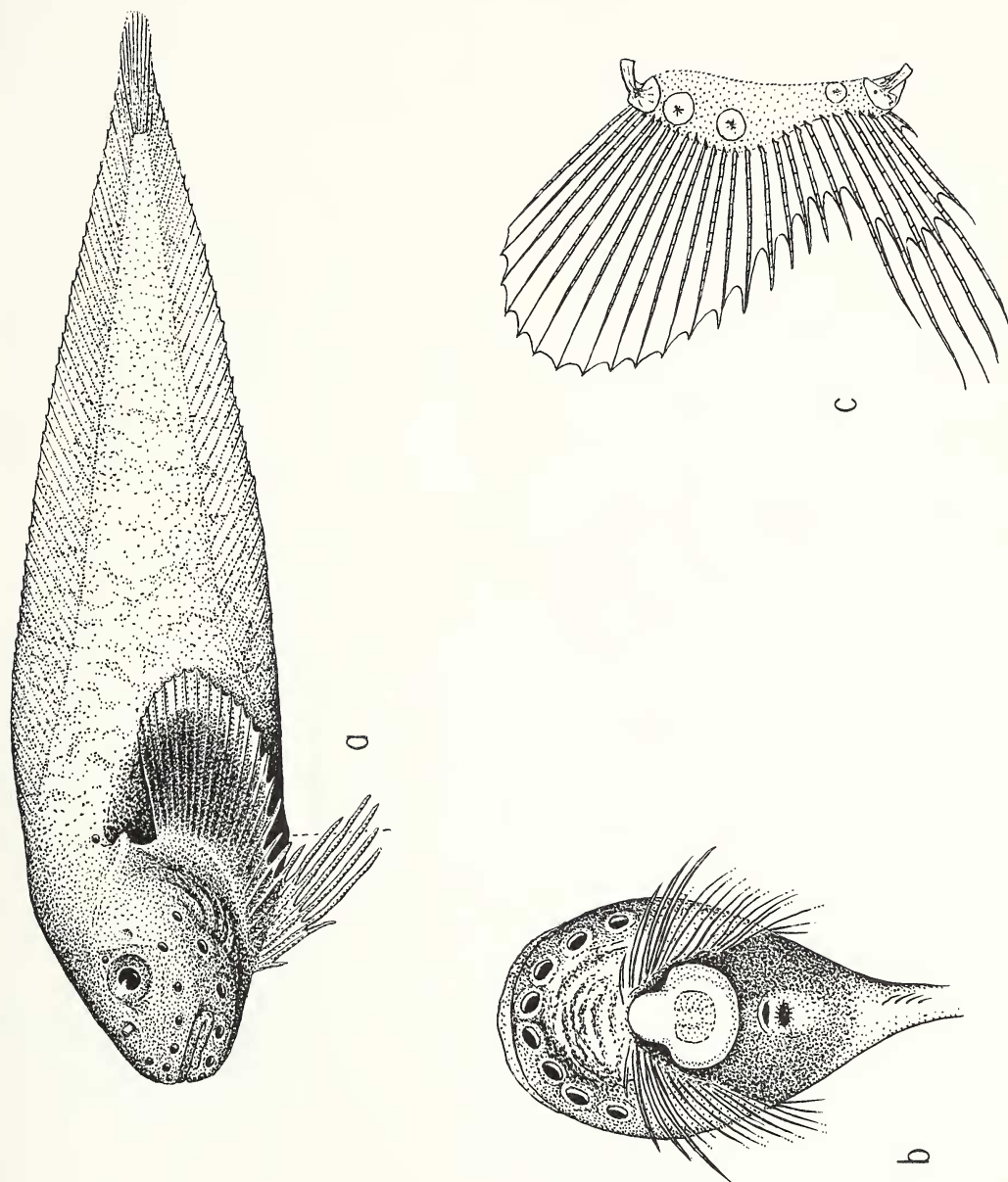


Figure 14. *Careproctus improvisus* n. sp. Holotype, USNM 327895, 69 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.

V 48, radials 3, gr 7, pores 2-6-7-1, pc 7. *Ratios*: HL 27.2% SL, width about 24.5 (90), bd 24.6, bdA 20.3, preD 30.4, preA 40.6, disk 11.0 (40), md 13.0, ma 27.0, da 2.5 (8.9), aAf 27.0, UPL 17.4 (63), NL 13.3, LPL 20.3, eye 5.9 (21.6), upper jaw 13.0 (47), io 9.4 (34), gs 7.0-7.2 (25-26).

Head rather large, width and depth nearly equal, a little less than HL. Upper contour of head straight, sloping from occiput to snout. Snout low, not projecting. Mouth horizontal, terminal, lower jaw symphysis not projecting. Upper jaw not quite reaching to below anterior margin of eye. Teeth simple, small, closely set, forming about 20 oblique rows of up to 7-8 teeth near premaxillary symphysis. Mandibular teeth similar. Symphyseal tooth gap narrow. Eye diameter moderate, pupil large. Nostril with short tube, slightly deeper than broad. Circumoral pores large, oval, and nearly nostril-like but not tubular (Fig. 14b); mandibular symphyseal pores oval, closely set, diameter twice as long as distance between them (pm 1-pm 1). Postorbital (t 1) and upper preoperculomandibular (pm 7) pores small. Suprabranchial pore single. Gill slit short, completely above the pectoral base. Opercular flap small.

Pectoral fin reaching to anal fin origin, with deep, distinct notch. Rays becoming shorter ventrally until 19th-20th ray, length of which is a little longer than half of upper lobe length. Lower lobe of seven rays, free distally, the longest (fifth to sixth from bottom) shorter than upper lobe. Origin of lowest pectoral ray below anterior part of pupil. Basal cartilaginous lamina with 3 (2+0+1) round unnotched radials; interradial fenestrae absent. Scapular helve wide, coracoid helve triangular owing to lateral strengthening plates. Coracoid base with small foramen.

Body tadpole-shaped, trunk moderately large. First dorsal ray rudimentary, its interneural between third and fourth neural spines. Pleural ribs absent. Disk flat, large; margin wide, anterior lobe prominent. Anus close to disk, a little less than midway between tip of lower jaw and anal fin origin. Hypural plate single, unslit. Last ray of dorsal and anal fins based on preurostyler vertebra, not reaching beyond middle of caudal fin. Caudal of 9 (4/5) rays, procurrent rays absent. Skin thin, lacking prickles. Subcutaneous layer moderately thick. Pyloric caeca short, about 3.5% SL, similar in size.

Body pale, black peritoneum and blackish oral and branchial cavities visible through body wall, darkening head and belly. Stomach pale, thinly covered by black reticulated blood vessels. Pyloric caeca pale. Ovarian eggs of two sizes present: 18-20 of about 2 mm diameter and remainder less than 0.8 mm.

**MATERIAL EXAMINED.** Holotype, USNM 327895, female, 78 mm TL, 69 mm SL, *Prof. Siedlecki* Cruise 601, Stn 116, 54°43'S, 38°36'W, 6 Dec. 1986. Pect. girdle N 664.

**DISTRIBUTION.** *Careproctus improvisus* was

caught by bottom trawl on the shelf of northern South Georgia Island at 260-306 m.

**ETYMOLOGY.** The specific epithet "improvisus" from the Latin "improvisus," unforeseen, because two other species of *Careproctus* with discontinuous depth distributions are known from South Georgia: *C. georgianus* (85-285 m) and *C. credispinulosus* (795-1400 m).

**COMMENTS.** *Careproctus improvisus* differs from the shallower-living *C. georgianus* in having fewer vertebrae (48 vs 56-59, rarely 54, 55, or 60) and dorsal and anal rays (D 45, A 38, vs D 51-54, A 45-48), dark oral and branchial cavities and a black peritoneum (light in *C. georgianus*), a much more deeply notched pectoral fin, larger mandibular pores, and a larger and less flattened head. *Careproctus improvisus* is not closely related to *C. georgianus* and the deeper-living *C. credispinulosus*, which has two pairs of long pleural ribs (vs none), a slit hypural plate (vs unslit), two suprabranchial pores, more pectoral rays (35-38 vs 27), and peculiar tiny thumb-tack prickles. In counts, *C. improvisus* is similar to the Antarctic *C. continentalis* and *C. steini* but differs clearly from both in its black peritoneum vs pale or black dotted, large mandibular pores vs small, form of the anterior lobe of the disk, and longer gill slit (25-26 vs 12-18% HL).

### *Careproctus inflexidens* n. sp.

Figure 15

**DIAGNOSIS.** V 64 (8+56), P 26, C 10 (1+4/4+1), radials 4 (3+1), round. Pleural ribs present, hypural plate single, unslit. Teeth canine, strong, recurved. Gill slit small, 3% SL, above pectoral base. Head short, 16.5%, preA 33.3%, disk 6.5% SL. Orobanchial cavities dusky, peritoneum black.

**DESCRIPTION.** *Counts*: D 60, A 54, P 26, C 10, V 64, radials 4, pores 2-6-7-1, gr 6, pc 6. *Ratios*: HL 16.5% SL, depth and width about 14.5, bd 18.5, bdA 17.5, preD 23.5, preA 33.3, disk 6.5 (39.4% HL), md 7.7, ma 20.0, da 5.9 (35.5), aAf 10.8, UPL 12.0 (73), NL 5.5, LPL about 19, eye 3.3 (19.7), sn 5.2 (31), io 7.0 (42), gs 3.0 (18.0), pc 4-7.5%.

Head short, broad, cheek vertical; head depth and width similar, slightly less than head length. Dorsal outline of head straight, gently sloping anteriorly. Snout high, blunt, not projecting. Mouth terminal, horizontal, upper jaw extending posteriorly to below anterior margin of eye. Teeth simple, closely set recurved canines. Upper jaw with about 10-11 oblique rows of rather slender, sharp teeth, forming bands about 5-6 teeth wide anteriorly; maximum width of tooth band about 22-24% of its length. Lower jaw with larger and blunter teeth. Symphyseal gap absent in both jaws. Eye small. Nostril appearing as a large pore without raised rim. Circumoral pores moderately large, round, contoured. Symphyseal mandibular pores closely spaced; distance between them (pm 1-pm 1) half



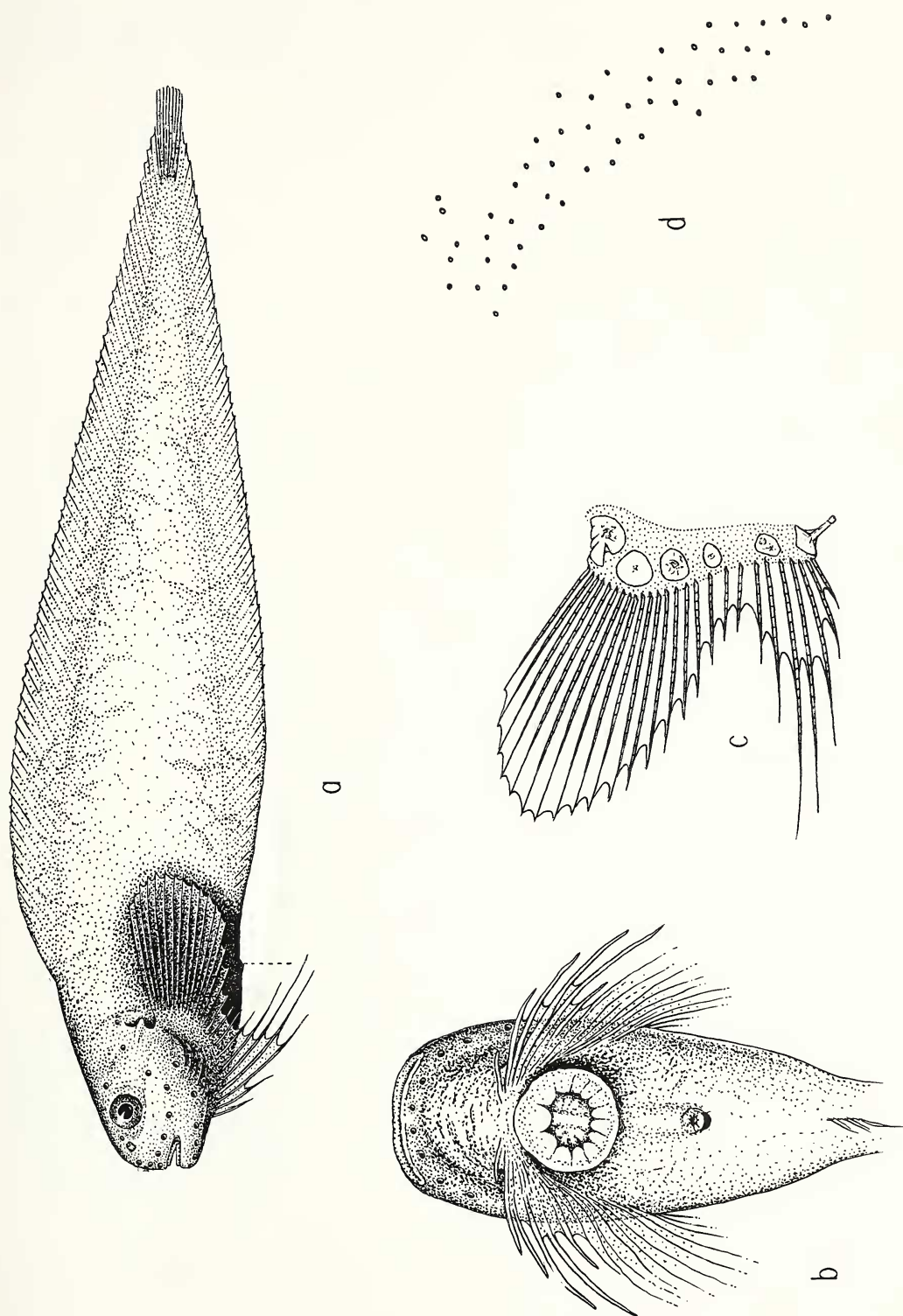


Figure 15. *Careproctus inflexidens* n. sp. Holotype, LACM 11142-1, 200 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

that of pm 1–pm 2. Suprabranchial pore single. Gill slit completely above P base (left side only; right side damaged), short. Opercular flap small, both damaged.

Upper pectoral lobe of 16 rays, reaching to anal fin origin; fin deeply notched, the 3 notch rays more widely spaced; rays becoming shorter ventrally to 18th ray, which is 44% length of upper P lobe. Lower P lobe with seven rays, fifth from the bottom clearly longest, longer than upper lobe. Origin of lowest pectoral ray below anterior edge of eye. Basal cartilaginous lamina of pectoral girdle widened dorsally, ventral third much narrower. Pectoral radials 4 (3+1), round, the two lowest slightly smaller.

Body rather elongated, trunk short, about one-third SL. Disk small, margin turned up a little posteriorly; disk center slightly cupped, wider than long; inner margin sculptured by segments. Anterior lobe of disk weakly developed, thin. Distance of anus from disk nearly equal to disk diameter. Distance from mandibular symphysis to anus slightly less than twice that from anus to anal fin origin. Long, thin pleural ribs on seventh and eighth parapophyses, at first directed caudally then ventrally. Anteriormost five or six dorsal rays shortened; the first rudimentary, its interneural between third and fourth neural spines; one free (rayless) anterior interneural present between second and third. Terminal dorsal and anal fin rays based on preurostylar vertebra, not reaching beyond middle of caudal fin. Urostyle with a single slitless hypural. Caudal fin of eight principal rays and two procurrent rays, one each above and below hypural (1+4/4+1). Skin remnant smooth, prickles absent. Pyloric caeca long and thick, unequal, about 4–7.5% SL.

Holotype well preserved, although partially skinned. "Peritoneum black. Skin dusky to nearly black anteriorly, opaque pinkish-white caudally, flesh light yellow ochre. Lining of oral and branchial cavities dark dusky" (Tompkins 1977:44–45). Stomach and pyloric caeca unpigmented.

Two sizes of ovarian oocytes present: nearly ripe eggs 5.0 mm diameter and small reserve oocytes 1 mm or less.

**MATERIAL EXAMINED.** Holotype, LACM 11142-1, female, 220 mm TL, 200 mm SL, *Eltanin* Stn 2091, 75°52'S, 168°53'W, 2049–2089 m, 3 Feb. 1968. Pect. girdle N 665.

**DISTRIBUTION.** The only known specimen was caught by bottom trawl (Blake trawl) in the northeastern Ross Sea at 2049–2089 m.

**ETYMOLOGY.** The species epithet is from the Latin "inflexus," recurved, and "dens," tooth, referring to the species' recurved teeth.

**COMMENTS.** *Careproctus inflexidens* is in the rib-bearing species group of *Careproctus*. It differs from most of the southern species in the larger number of vertebrae (64 vs 46–54), dorsal and anal fin rays (D 60, A 54 vs D 41–48, A 33–45), and in the short head (16.5 vs 28–32% SL). It is similar

to the South African *C. albescens* Barnard (1927) in its high number of vertebrae, but it is distinguished from the latter by fewer pectoral fin rays (26 vs 33–35), a single undivided hypural plate (divided in the African species), the round, unnotched pectoral radials (vs notched), and the black peritoneum (vs brown).

### *Careproctus lacmi* n. sp.

Figure 16

**DIAGNOSIS.** V 46 (8+38), P 27, C 11 (2+4/5), radials 3, (2+0+1), round. Pleural ribs absent, hypural plate single. Head high, depth greater than length. Mouth terminal, upper jaw extending to below posterior eye margin, teeth simple. Gill slit above P base. Disk large, about one-half head length. Head 24.6%, preA 32.8%, disk 13.0% SL. Orobranchial cavity pale, peritoneum pale brown, pyloric caeca dark gray.

**DESCRIPTION.** *Counts:* D 42, A 36, P 27, C 11, vert. 46, radials 3, pores 2-6-7-1, gr 5, pc 10. *Ratios:* Head 24.6% SL, depth 26.2, width 18.0, bd ca 26.5, bdA 13.0, preA 32.8, disk 13.0 (54.5), md 11.5, ma 26.6, da 4.9 (20.0), aAf 13.0, UPL 18.9 (77), notch ray 6.6, LPL more than 21, eye 3.6 (14.7), sn 7.4, upper jaw 13.5 (55), gill slit 5.7% (23.3%). Measurements from Tompkins (1977) and our examination.

Head deep, compressed, its dorsal outline steeply sloping from occiput to upper jaw symphysis, anterior profile forming a right angle with lower jaw. Mouth terminal, horizontal, large; upper jaw extending to below posterior margin of eye; length of upper jaw slightly greater than one-half head length. Teeth simple, conical, premaxillary symphyseal gap present; no gap in lower jaw. Premaxillary tooth band rather narrow, maximum width about 8–9% its length (Fig. 16c). Eye small, about one-seventh HL; pupil large, only slightly less than eye diameter. Circumoral pores moderate, round to oval, contoured. Mandibular pores abnormally arranged: right pm 1 at mid-symphysis, right pm 2 absent. Suprabranchial pore single, small. Gill slit completely above P base, about one-fourth HL. Opercular flap projecting, both sides damaged.

Pectoral fin partly damaged; moderately notched, notch rays about one-third upper P lobe length. Rays 28 (19+1+8), counting the lowest, rudimentary, ray, which is visible by clearing and staining. Lower pectoral lobe slightly longer than upper. Basal cartilaginous lamina narrow, dorsalmost part wider. Interradial fenestrae absent. Radials 3 (2+0+1), round, both dorsal radials slightly smaller than ventral one.

Body tadpole-like, attenuate postabdominally. Undamaged disk large, at least one-half HL. Distance from disk to anus equal to about two-thirds disk diameter. Pyloric caeca 10, tapered from base to tip, about 5–6% SL. Pleural ribs absent, hypural plate widened distally, not divided but with a proximal slit rudiment. Abdominal vertebrae few (8).

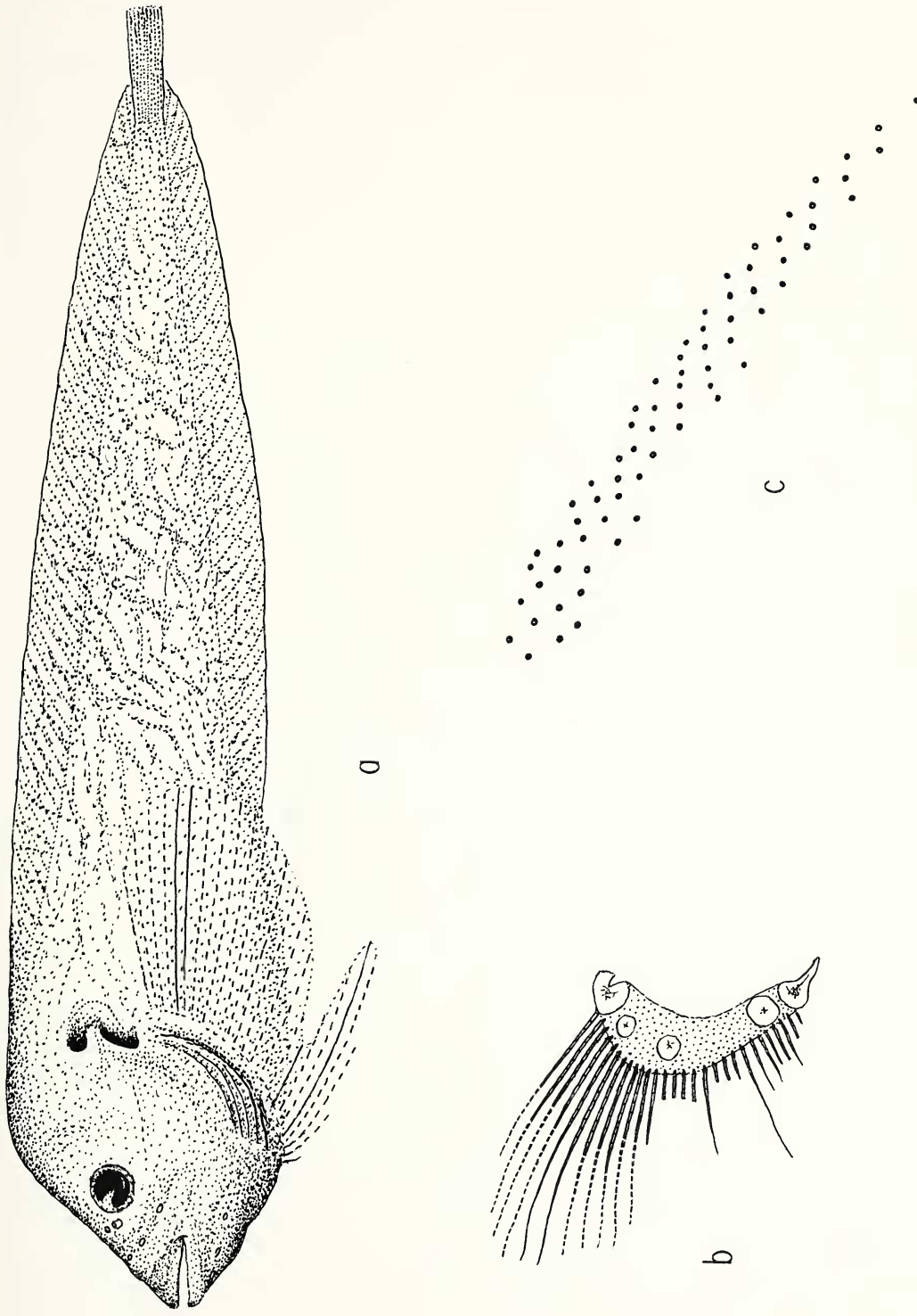


Figure 16. *Careproctus lacmi* n. sp. Holotype, LACM 10747-4, 61 mm SL; a, lateral view; b, pectoral fin and girdle; c, premaxillary tooth pattern.



Interneural of first dorsal fin ray between neural spines 3 and 4; last dorsal ray on next to last vertebra; last anal fin ray based on preurostyler vertebra.

Body and orobranchial cavity light, peritoneum light brown. Pyloric caeca unusually dark gray.

**MATERIAL EXAMINED.** Holotype, LACM 10747-4, male, 69 mm TL, 61 mm SL, *Eltanin* Stn 1509, 58°57'S, 54°07'W, 3817–3931 m, 25–26 Jan. 1966. Pect. girdle N 685.

**DISTRIBUTION.** The holotype was caught by bottom trawl at abyssal depths (3817–3931 m) of the southwestern Scotia Sea.

**ETYMOLOGY.** The new species is named in honor of the Natural History Museum of Los Angeles County, the original repository for all liparid fishes collected during the *Eltanin* expeditions in the Southern Ocean.

**COMMENTS.** The holotype has partly damaged pectoral fins, gill cover, and ventral disk; therefore some measurements cited are from Tompkins (1977). *Careproctus lacmi* is similar to *C. ampliiceps* from the Ross Sea in counts and the high, compressed head but differs from it in the shorter gill slit (5.7 vs 12.4% SL), the shorter head (24.6 vs 34.1% SL), greater disk diameter (54.5 vs 20.3% HL), and in the smaller circumoral pores and lighter peritoneum (light brown vs brown-black).

### *Careproctus leptorhinus* n. sp.

Figure 17

**DIAGNOSIS.** V 55 (9+46), P 23, C 10 (1+5/4), radials 2, opposed (1+0+0+1), round. Pleural ribs absent, hypural plate single, unslit. Mouth inferior, teeth trilobed, acute-angled, similar in size. Nostril tube slender and long. Gill slit small, above P base. Skin covered with small pits containing needle-like deciduous prickles. Head 18.7%, preA short, 28.0%, disk 6.0% SL. Body dark dusky, peritoneum black. Stomach covered with branching black-pigmented blood vessels.

**DESCRIPTION.** *Counts:* D 50, A 44, P 23, C 10, V 55, radials 2, pores 2-6-7-1, gr 6, pc 6. *Ratios:* HL 18.7% SL, its width 11.7, bd 15.3, bdA 10.7, preA 28.0, disk 6.0 (43% HL), md 6.3, ma 13.1, da 3.1 (16), aAf 7.5, UPL 14.8 (79), LPL 15.7, eye 3.3 (18), sn 6.3 (45), gs 4.3 (23).

Head short, compressed laterally, cheeks vertical. Dorsal outline of head straight, gently sloping to low, bluntly rounded, moderately projecting snout. Mouth inferior. Upper jaw extending posteriorly to below middle of eye. Teeth in both jaws distinctly trilobed, acute-angled; lobes of similar size or the middle largest; lateral lobe acute-angled, the middle slightly blunted or the apex of a right angle. Teeth arranged in seven oblique rows of about three to four teeth each anteriorly. Premaxillary tooth band short and wide, greatest width about 27–28% its length (Fig. 17d). Symphyseal gap absent from both jaws. Eye small, slightly damaged. Nostril distinctive, forming slender tube three times diameter of

opening. Infraorbital pores rather large, round; mandibular pores look like small tubercles with openings. Symphyseal mandibular pores well spaced. Gill slit small, completely above P base. Opercular flap small, damaged.

Pectoral fin deeply notched, rays partly broken. Longest ray of lower pectoral lobe slightly longer than upper lobe. Single notch ray broken, well spaced from rays of lower and upper pectoral lobe; P = 23 (13+1+9). Lower half of basal cartilaginous lamina of pectoral girdle narrow. Radials two, round, rather large (1+0+0+1), first below scapula, second above coracoid (Fig. 17c). Scapula notched, dorsal radial notched above and below, a small fenestra present in basal lamina between scapula and first radial. Scapular helve comparatively long, without lateral ribs; coracoid with a long, straight helve framed by lateral ribs, the anterior of which is longer.

Body elongate, tapering posteriorly; preanal distance short, less than one-third SL (measured from radiograph). Body partly skinned; skin remaining on head with small pits in each of which there were up to five thin, sharp, long prickles discovered during initial examination, these now lost. Disk small, nearly round, anterior lobe weakly developed. Margin of disk smooth; posterior of marginal ring narrow, its width about 40% diameter of disk center, which is slightly cupped. Distance of anus from disk equal to half disk diameter. Pleural ribs absent. No distinct boundary between abdominal and caudal vertebrae; parapophyses of ninth vertebra connected, forming haemal spine one-third length of 10th haemal spine of first caudal vertebrae; latter supports interneural of first anal ray. Hypural plate single, widened distally, unslit. Posterior dorsal and anal rays overlapping anterior third of caudal fin. Caudal rays slightly displaced, rays clearly 10 (1+5/4). Two to three anterior dorsal rays rudimentary; interneural of first D ray between fourth and fifth neural spines. Pyloric caeca six, similar in size, short, about 4% SL.

Color of skin remaining on head and partly on body more or less dusky (gray) because of "faded" (decompressed) pigment cells, but at first examination (Tompkins 1977:115) body was "dark dusky; flesh sand colored. Lining of oral and branchial cavities dusky." Peritoneum black, stomach dusky, covered with black net of branching blood vessels.

The holotype is a mature male with well-developed testes in maturity state III–IV.

**MATERIAL EXAMINED.** Holotype, LACM 10453-4, male, 82 mm TL, 75 mm SL, *Eltanin* Stn 105T, 55°41'S, 60°55'W, 4246–4295 m, 17 July 1962. Pect girdle N 683.

**DISTRIBUTION.** Collection data for *C. leptorhinus* are confusing. The original label states "Antarctic *Eltanin* Sta 105T" without coordinates or depth. The guide to biological stations of the *Eltanin* (Savage and Geiger 1965) shows that station 105 is from the fourth *Eltanin* cruise and was oc-

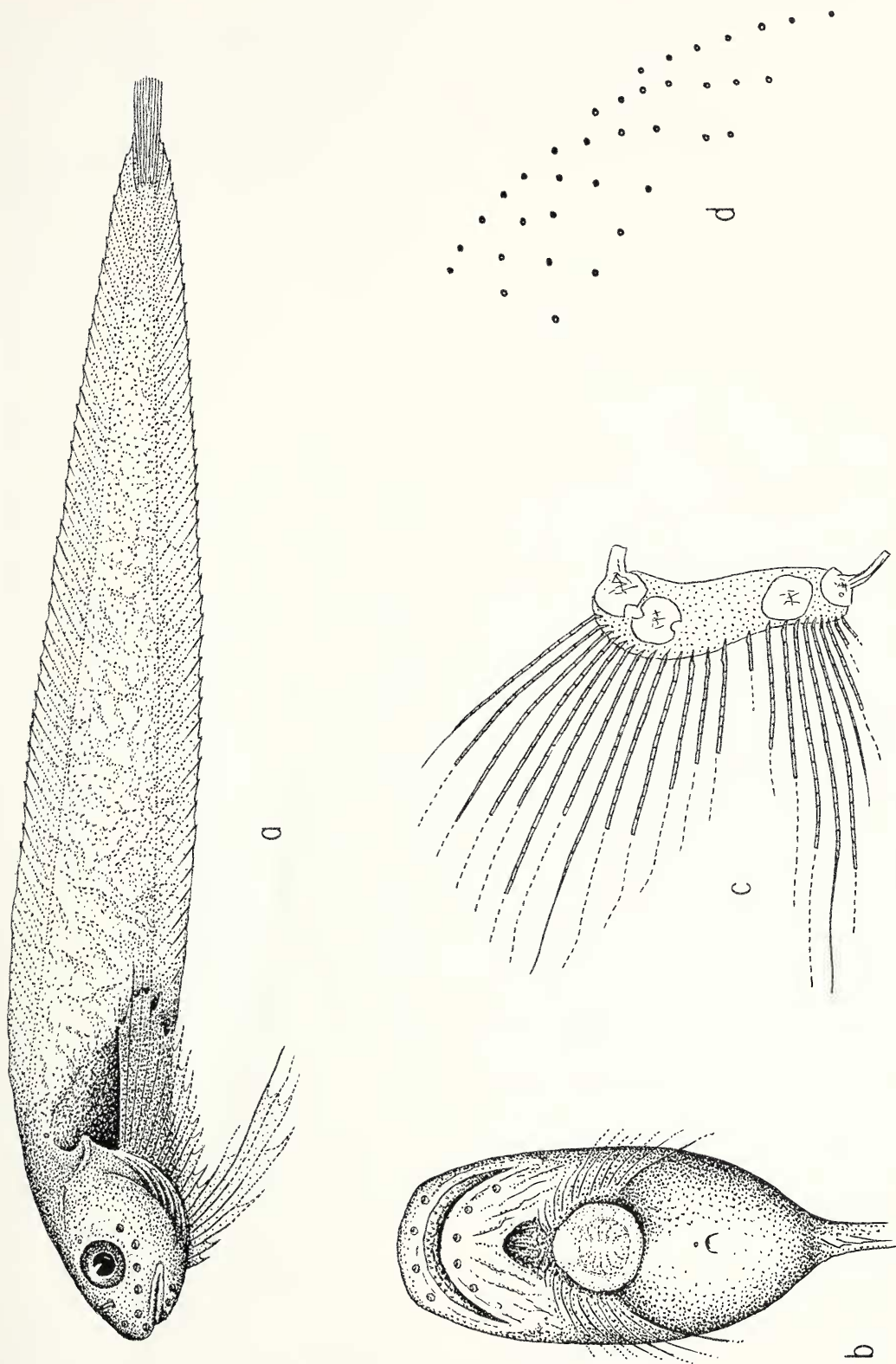


Figure 17. *Careproctus leptorhinus* n. sp. Holotype, LACM 10453-4, 75 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

cupied on 17 July 1962 at 55°41'S, 60°55'W, 4246–4295 m depth. On the GEBCO chart N 516 (Johnson et al. 1983), the location of station 105 falls in the northern part of deep Yaghan Basin (depths more than 4000 m), located south of Burdwood Bank. However, only plankton tows are noted for this station. We suggest that the letter T (105T) indicates trawling also. Stations were numbered continuously for all *Eltanin* cruises; therefore, it is unlikely that the station data refer to another station.

**ETYMOLOGY.** The species name is from the latinized Greek “leptos” (thin, slender) and “rhinos” (nose, nostril).

**COMMENTS.** In counts and general appearance *C. leptorhinus* is similar to *C. tricapitidens*, but the former differs distinctly in lacking pleural ribs (vs one pair of short ribs in *C. tricapitidens*); long, slender tubular nostril (vs nostril pore-like); and short preanal distance (28 vs 39% SL). The last character is unique for *C. leptorhinus*; in all other known southern *Careproctus*, preanal distance is one-third to one-half of SL. It should also be noted that both *C. leptorhinus* and *C. tricapitidens* have trilobed teeth; however, the tips of the teeth of *C. leptorhinus* are acute-angled, whereas those of *C. tricapitidens* have tubercle-like tips. *Careproctus leptorhinus* is the only species with trilobed teeth among ribless southern *Careproctus*.

### *Careproctus longipectoralis* Duhamel 1992

*Careproctus longipectoralis* Duhamel 1992:186, fig. 2a (Weddell Sea; color photograph).

**EXPANDED DIAGNOSIS.** V 58 (9+49), P 25. Pleural ribs absent, hypural plate single, unslit. Mouth terminal, oblique. Teeth simple. Gill slit oblique, long, about one-half head length. Pectoral fin deeply notched, long, 160% HL. Disk small, scarcely exceeding eye diameter. Anus just behind disk. Pyloric caeca 11, different sizes. Head 22.8%, preA 39.8%, disk 6.5% SL. Body uniformly bright violet, pectoral nearly black. Orobranchial cavity dark. Peritoneum black.

**DESCRIPTION.** (Based on Duhamel's data with additions from a radiograph of the holotype.) Counts: D 53, A 47, P 25, C ca 9(8?), V 58, pores 2-6-7-1, pc 11. Ratios: HL 22.8% SL, bd and bdA 26.5, preD 29.1, preA 39.8, disk length 6.5 (28.5% HL), disk width 5.8, sn to disk 10.1 (44.1), da 1.3 (5.7), UPL 36.6 (160), LPL 20.4, E 5.8 (25.6), gs 12.1 (53.0).

Head moderately small but massive, not compressed laterally; dorsal outline horizontal, steeply rounded from above eye to nearly vertical tip of short snout. Mouth terminal, oblique, upper jaw extending to below anterior margin of eye. Teeth simple, conical, multiserial. Eye small, about one-fourth HL. Circumoral pores moderately small, distinct, round. Symphyseal mandibular pores well spaced. Nostril similar to infraorbital pores. Gill slit long, about one-half HL, extending obliquely to

in front of mid-upper P lobe. Opercular flap well developed, rounded.

Pectoral fin low, upper ray on horizontal below orbit, deeply notched. Upper lobe long, 160% HL; lower P lobe 20.4% HL, separated from upper by 3 short notch rays with free tips. Pectoral 15+3+7 = 25. Pectoral girdle unexamined.

Trunk nearly uniform in depth, deeper than HL. Skin naked, prickles absent. Subcutaneous layer probably well developed judging from original photograph. Disk small, slightly larger than eye diameter, round except for anterior lobe. Anus just posterior to disk. Pyloric caeca of uneven length. Pleural ribs absent. Last 3–4 parapophyses connected to form short haemal spines; abdominal and caudal vertebrae distinct, 9+49. Hypural plate single, narrow, long, unslit. Number of caudal fin rays difficult to count 9 (8?); procurent rays absent.

In life, body uniformly bright violet, darker along margins of unpaired fins and probably on belly. Pectoral fin even darker, nearly black. Circumoral pores pinkish, lighter than head. Orobranchial cavity dark, peritoneum black, stomach unpigmented.

Holotype female, oocytes of four sizes in one ovary: 5.7 mm, 7 oocytes; 3.0 mm, 4; 1.5 mm, 20; and 1.1 mm, 92 (Duhamel 1992). Eleven ripening, others immature.

**MATERIAL EXAMINED.** Radiograph of holotype: MNHN 1991-356, female, 192 mm TL, 168 mm SL, *Polarstern* Stn 295AGT26, 71°06'S, 13°48'W, 2025–2037 m, 21 Feb. 1989.

**DISTRIBUTION.** The holotype was caught by bottom trawl in the northeastern Weddell Sea (off Cape Norvegia) at a depth of 2025–2037 m.

**COMMENTS.** Our redescription is based on Duhamel's (1992) data with additions from a radiograph of the holotype. The only known specimen is an adult female of 192 mm TL in good condition (to judge by a color photograph). Duhamel (1992) stated that *C. longipectoralis* differs from all Southern Ocean *Careproctus* except for *C. georgianus* in the great number of vertebrae and dorsal and anal fin rays. The latter has more pectoral fin rays (30–34 vs 25). However, *C. longipectoralis* differs greatly from the shallow-living *C. georgianus* in many basic characters, including fewer fin rays, oblique and longer gill slit (vs vertical, above P base), deeply notched pectoral fin (vs P fan-shaped, scarcely notched), black peritoneum (vs pale), P longer than one-third SL (vs less than one-fourth SL), and other characters. Duhamel (1992) correctly noted that *C. longipectoralis* is closely related to *C. profundicola* Duhamel (see the latter description for the differences).

### *Careproctus minimus* n. sp.

Figure 18

**DIAGNOSIS.** V 44 (8+36), P 29, C 10 (1+4/5), radials 2, round, opposed (1+0+0+1). Pleural ribs absent, hypural plate single, unslit. Mouth terminal, teeth simple. Symphyseal mandibular pores



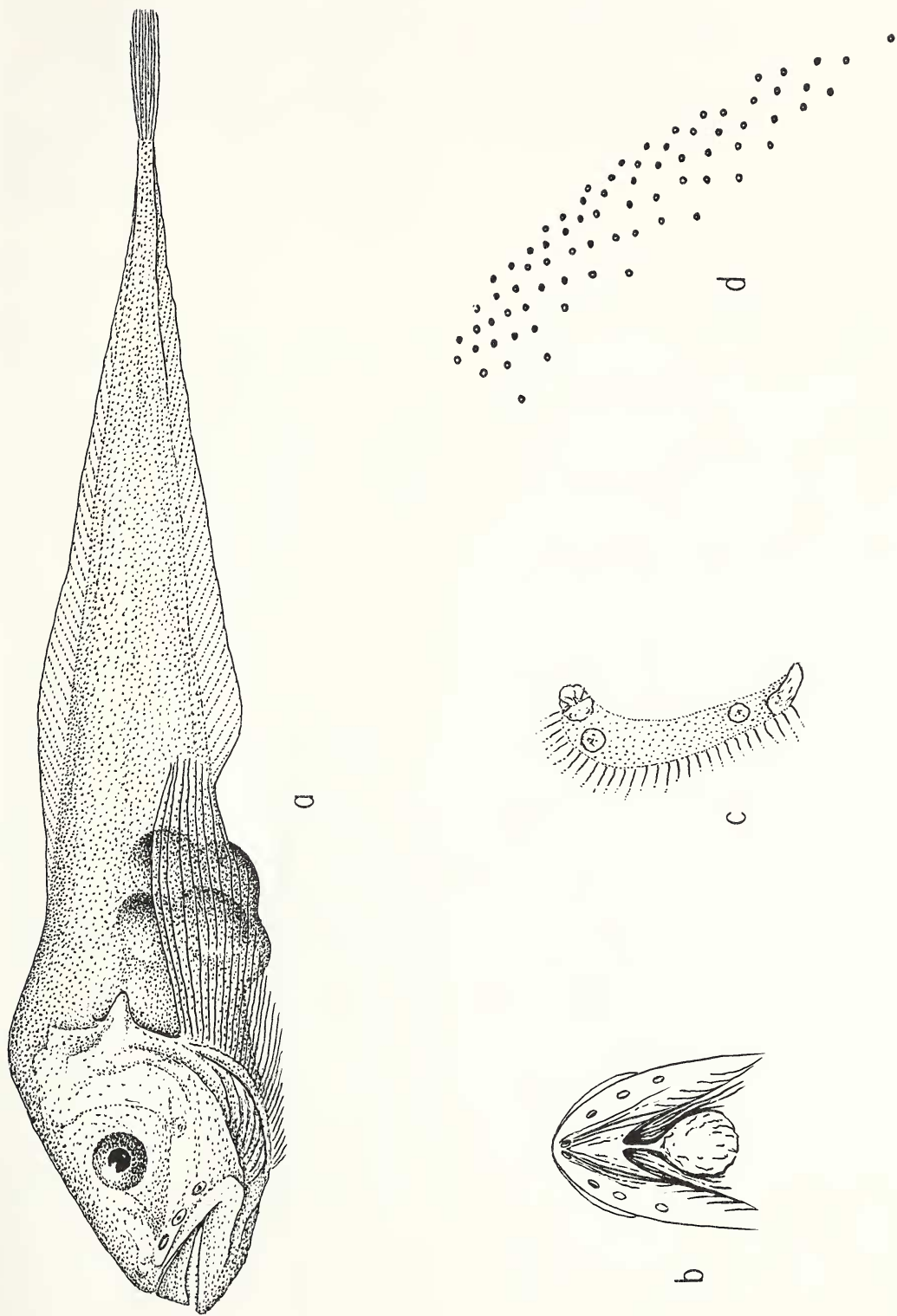


Figure 18. *Careproctus minimus* n. sp. Holotype, LACM 11069-1, 37 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

large, oval, closely spaced. Gill slit above P base. Pectoral fin unnotched. Head 30%, preA 44.6%, disk 10.3% SL. Body pale with small brown spots. Orobranchial cavity and peritoneum light.

**DESCRIPTION.** *Counts:* D 39, A 35, P 29, C 10, V 44, radials 2. *Pores* 2-6-7-1, gr 5. Pyloric caeca unknown. *Ratios:* Head 30.3% SL, its width ca 20, bd ca 22, bdA 13.5, preD 30.8, preA 44.6, disk 10.3 (34% HL), md 13.5, pectoral fin length ca 23 (76), eye 3.8 (12.5), sn 8.4, upper jaw 13.2, gs 8.1 (27).

Head large, cheeks vertical, snout not projecting. Mouth terminal, horizontal, lower jaw slightly extending. Upper jaw nearly reaching to below middle of eye. Teeth in both jaws simple, sharp, densely set. Premaxillary tooth band rather wide, its greatest width about 19–20% of its length (Fig. 18d). Symphyseal gap absent in both jaws. Eye small, about 12% HL. Circumoral pores rather large; infraorbital pores round, the fifth pore (io 5) below posterior margin of eye. Symphyseal mandibular pores oval, closely spaced, distance between them considerably less than pore diameter. Suprabranchial single. Gill slit completely above pectoral base, slightly more than one-fourth HL. Opercular flap extending behind pectoral base, deformed.

Pectoral fin reaching a little behind anal fin origin; upper lobe of 15–16 rays, about three-fourths HL. Pectoral rays gradually shortening ventrally, not forming distinct lower lobe. Seven lowest P rays with free tips. Origin of lowest pectoral ray below anterior margin of eye. Basal cartilaginous lamina narrow, with only two small, round radials, one below scapula, second above coracoid. Scapula round with thin helve. Coracoid with long lateral ribs, the posterior wider.

Body moderately elongated. Preanal distance large, slightly less than half SL. Disk now deformed (oval with wider posterior part); originally “circular in form” (Tompkins 1977). Skin naked, prickles absent. Position of anus unclear, caeca unexamined. Pleural ribs absent. Anteriormost dorsal fin ray rudimentary. Interneural of the first dorsal fin ray between fourth and fifth neural spines; one free anterior interneural present. First caudal vertebra (ninth) with haemal spine half length of that on 10th vertebra. Hypural plate single, widened distally, unslit. Caudal fin of 10 (1+4/5) rays.

Body uniformly pale. Before drying, “skin transparent and colorless except for the relatively large scattered spots on the body created by aggregations of melanophores, tiny brown pigment spots” (Tompkins 1977:84). Orobranchial cavity and peritoneum pale.

The holotype is a ripe female 43 mm TL, filled with relatively large eggs about 3 mm diameter and many small oocytes of about 1 mm diameter. The number of ripe eggs is probably no more than 10–12.

**MATERIAL EXAMINED.** Holotype (dried out), LACM 11069-1, radiograph 0176, adult female, 43 mm TL, 37 mm SL, *Eltanin* Stn 1595, 54°39'S,

57°07'W, 124–128 m, 14 March 1966. Pect. girdle N 702.

**DISTRIBUTION.** The holotype of *C. minimus* was caught at 124–128 m by bottom trawl on Burdwood Bank (south of Falkland Islands).

**ETYMOLOGY.** Latin name *minimus*, the least, notes the small size of the adult holotype.

**COMMENTS.** It is difficult to describe the holotype adequately because of its poor condition; at some point it dried out, although it is now in liquid. In particular, it is not possible to determine number of pyloric caeca, position of anus, or to take all the measurements.

*Careproctus minimus* is the smallest species of the genus in the Antarctic Region. It is similar to *C. falklandicus* (Lönnberg 1905) in having few vertebrae and an unnotched pectoral fin but differs distinctly in having one suprabranchial pore (vs two), simple teeth (vs tritubercular), unslit hypural plate (vs slit), large circumoral pores (vs small), and other characters. It should be noted that both species are sympatric on Burdwood Bank, living at similar depths. This tiny *Careproctus* differs clearly from other ribless species having few vertebrae by the unnotched pectoral fin lacking a distinct lower lobe. *Careproctus acaecus* Andriashev (1991) differs in having a larger eye (25 vs 12.5% HL) and small mandibular symphyseal pores opening in a common pore.

### *Careproctus novaezelandiae* Andriashev 1990

Figure 19

*Careproctus novaezelandiae* Andriashev 1990b:13, fig. 3 (between Antipodes and Bounty Islands).

**EXPANDED DIAGNOSIS.** V 53–54 (10+43–44), P 37–38, C 12 (1+5/5+1), radials 4 (3+1), 3 upper notched, with 3 interrational fenestrae. HL 27.3–30%, preA 41–45%, disk 6–6.7% SL. Pleural ribs well developed, 2 pairs present, saber-like. Hypural plate single, slit. Mouth terminal, teeth distinctly tricuspid, sharp. Mandibular symphyseal pores small, round, widely spaced. Gill slit completely above pectoral base. Peritoneum and stomach black, pyloric caeca pale.

**DESCRIPTION.** *Counts:* D 47–48, A 40–43, P 37–38, C 12, V 53–54, radials 4, gr 8, pc 7–12, pores 2-6-7-1. *Ratios of LACM 11085-3:* HL 27.3% SL, its width 19.0, bd 19.4, bdA ca 12, preA ca 41, disk 6.7 (24.7), UPL 20.0 (73), LPL 14.7, E 9.1 (33.3), gs 7.3 (26.7).

Head large, compressed. Mouth terminal, snout not projecting. Most teeth trilobed, premaxillary teeth in short, indistinct oblique rows of up to 3–4 teeth each; outer teeth arrow-shaped or shouldered, inner teeth trilobed, lobes sharp, equal, or middle lobe largest. Maximum width of tooth band 16–17% its length (in 55-mm juvenile) (Fig. 19b). Lower jaw teeth similar. Eye diameter about 25% HL in large specimen, 30% in juvenile. Circumoral pores small; mandibular symphyseal pore pair

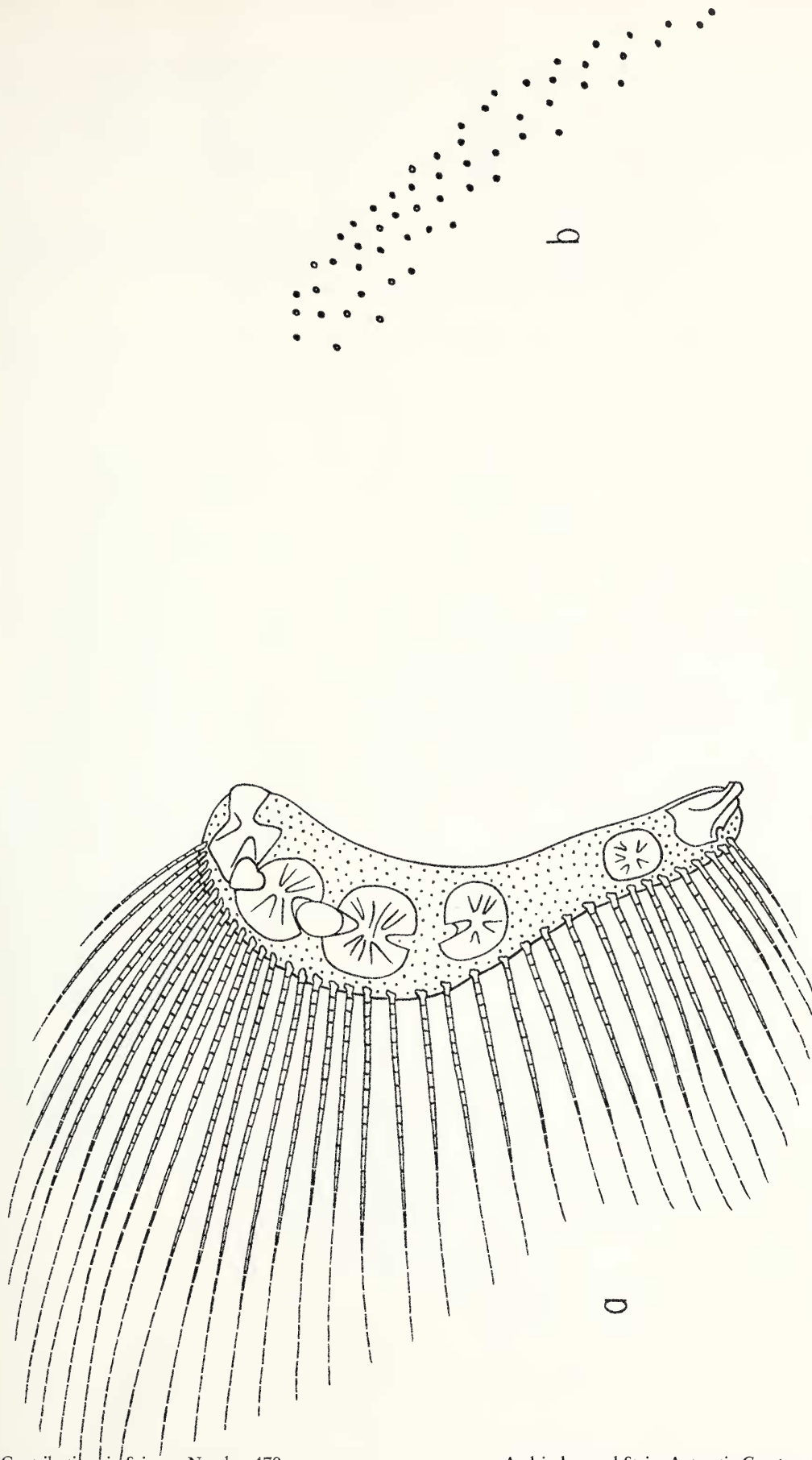


Figure 19. *Careproctus novaezelandiae* Andriashev. Holotype, ZISP 49540, 87 mm SL: a, pectoral fin and girdle. LACM 11085-3: b, premaxillary tooth pattern.



widely spaced. Suprabranchial pore single. Gill slit high above pectoral base.

Pectoral fin weakly notched; rays of upper lobe becoming shorter ventrally to 23rd or 24th ray. Lower lobe of 12–13 rays, the longest seventh to ninth from bottom. Lowest rays shorter and thinner, anteriormost originating in front of vertical through pupil. Basal cartilaginous lamina with four radials (3+1), scapula and three upper radials notched, separated by three interradiar fenestrae. Scapular helve short, widened distally. Coracoid with foramen and lateral ribs.

Head and body deep, depth at anal fin origin about one-fifth SL in holotype. Three pairs of pleural ribs present, posterior two pair saber-like. Interneural of first dorsal ray between fourth and fifth neural spines. Disk small, anus about 1.5 times disk diameter behind disk. Trunk long, preanal length almost half SL. Preurostilar vertebra not bearing fin rays. Posteriormost D and A rays not reaching beyond anterior third of caudal fin. Hypural plate divided by slit nearly to base, one arc-shaped epural present. Caudal fin of 10 primary rays and two procurrent rays. Skin without prickles. Pyloric caeca long, about 14% SL.

Body pale, orobranchial cavity pale, palate gray; peritoneum and stomach black, pyloric caeca unpigmented.

**MATERIAL EXAMINED.** Two specimens from two stations. Holotype, ZISP N 49540, sex unknown, 99 mm TL, 87 mm SL, FS *Milogradovo* trawl 67, 48°53'S, 178°39'W, about 800–1000 m, 20 Apr. 1973. Pect. girdle N 326, radiogr. N 10301. Other material, LACM 11085-3, juv. male, 55 mm SL, *Eltanin* Stn 1990, 53°50'S, 169°57'E, 954–971 m, 1 Jan. 1968.

**DISTRIBUTION.** The holotype was taken between Antipodes and Bounty Islands at 800–1000 m; the paratype was caught by bottom trawl (Blake trawl) southward off Campbell Island, at the southernmost end of the New Zealand Plateau between 954–971 m.

**COMMENTS.** The holotype is deformed (squashed laterally during fixation) and, therefore, many exact measurements are impossible. The comparable characters of the LACM juvenile do not differ significantly from those of the holotype.

*Careproctus novaezelandiae* is grouped with the two Antarctic rib-bearing species *C. parini* and *C. catherinae* in having distinctly tricuspid teeth, notched radials, and a divided hypural plate; it differs from both in having more numerous vertebrae (53–54 vs 46–48), a shorter gill slit (above P base vs in front of 5–17 rays), fewer caudal rays (12 vs 14), weakly notched P, and black stomach (vs pale). It also differs from the South African *C. albescens* Barnard 1927 in having fewer vertebrae (53–54 vs 58–64), and black peritoneum and stomach. According to Dr. M.E. Anderson (personal communication; J.L.B. Smith Inst. Ichthyology, Grahams-town), the former is a senior synonym of *C. grisellae* Lloris 1982. We include this species in our re-

view of Antarctic *Careproctus* because we predict its occurrence in deep water near Macquarie Island.

## *Careproctus parini* Andriashev and Prirodina 1990

Figure 20

*Careproctus parini* Andriashev and Prirodina 1990a:2, figs. 1, 2 (South Shetland Islands). Andriashev and Prirodina 1990b:715, figs. 2B, 4A, 5A (diagnosis; in key).

**EXPANDED DIAGNOSIS.** D 41–42, A 34–35, P 32–35, C 14 (2+5/6+1), V 46 (11+35), radials 4 (3+1), notched, caeca 10–11, finger-like and elongate, pores 2-6-7-1, gr 9–11. Pleural ribs two, strong, saber-like, hypural plates two, fused proximally. Parhypural separated by long slit from hypural. Mouth nearly terminal, though snout slightly projecting. Teeth strongly trilobed, middle lobe larger, all lobes sharp. Cephalic pores small, round; symphyseal mandibular pores widely spaced. Gill slit long, extending ventrally in front of 6–11 pectoral rays, 10.4–13.1% SL. Interspace between disk and anus slightly less than disk diameter. Pectoral moderately notched, rudimentary rays absent. Pyloric caeca 10–11, elongated. Head 28.1–30.3%, preA 42.8–ca 49%, disk 8.0–10.3% SL. Body lilac-tinted, peritoneum brown.

Counts and ratios of LACM specimens. *Counts:* D 41, A 34, P 32, 33, C 14 (2+5/6+1), V 46 (11+35), radials 4 (3+1), notched; pc 10–11, gr 8–9. *Ratios of LACM 10785-1:* HL 30.8% SL, its width 19.3, bd 19.3, bdA ca 16, preD 35.5, preA 46.0, disk 8.8 (28.6% HL), md 14.9, ma 32.2, da 10.3, aAf 12.8, UPL 18.2 (59.4), LPL 15.8, eye 5.7, sn 9.0, upper jaw 14.9, lower jaw 15.0, gs 13.2 (42.7).

**MATERIAL EXAMINED.** Five specimens from four stations. *Holotype*, ZISP 49344, female, 187 mm TL, 170 mm SL, *Prof. Mesyatsev* trawl 219, 61°10'S, 50°42'W, 850–860 m, 5 Feb. 1975, Coll. A. Kotlyar. Pect. girdle N 323. *Paratypes*, ZISP 49345, male, 202 mm TL, 178 mm SL, female, 125 mm SL, *Prof. Mesyatsev* trawl 216, 61°37'S, 55°45'W, 850–750 m, 4 Feb. 1975, Coll. A. Kotlyar. Pect. girdle N 318, N 317. *Additional material:* LACM 10785-1, immature male, 87 mm TL, 76 mm SL, *Eltanin* Stn 997, 61°44'S, 55°56'W, 769 m, 14 March 1964, Pect. girdle 672; LACM 10481-1, male, 98 mm SL, *Eltanin* Stn 426, 62°27'S, 57°58'W, 809–1116 m, 5 Jan. 1963. Pect. girdle N 673.

**DISTRIBUTION.** *Careproctus parini* was described from a specimen collected off the South Shetland Islands at 750–860 m. The LACM specimens were also caught near the South Shetlands but off Elephant and King George Islands by bottom trawls at 969–1116 m.

**COMMENTS.** The LACM specimens are young and resemble the type in all details except for a more elongated body and slightly larger eyes. *Car-*

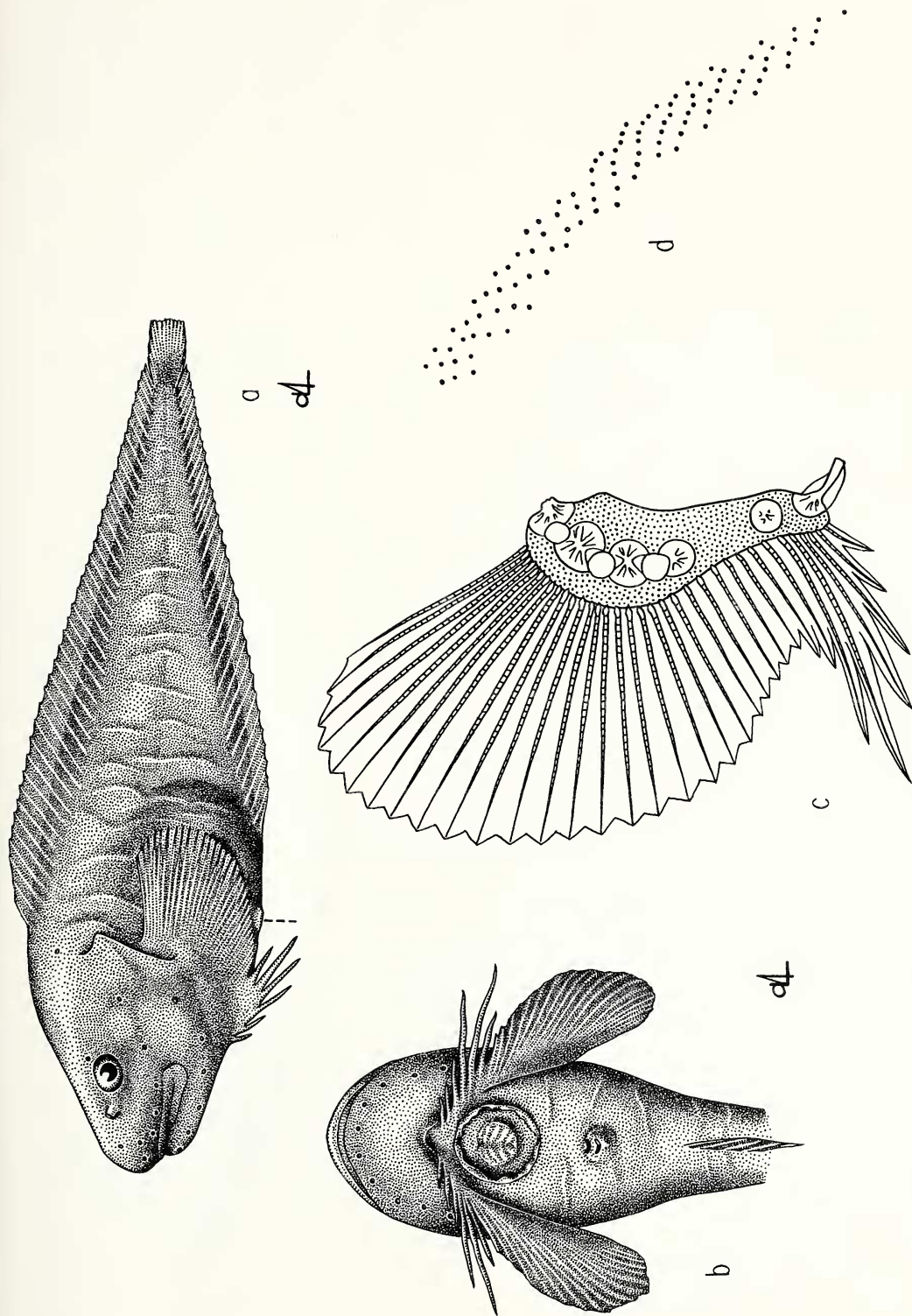


Figure 20. *Careproctus parini* Andriashev and Prirodina. ZISP 49344, 170 mm SL. a, lateral view; b, ventral view; c, pectoral fin and girdle. LACM 10481-1: d, premaxillary tooth pattern.



*eptoctus parini* is closely related to *C. catherinae*; see description of the latter for more details.

### *Careproctus parviporatus* n. sp.

Figure 21

**DIAGNOSIS.** V 52 (10+42), P 26, C 9 (4/4+1), radials 3 (2+0+1), round. Pleural ribs absent, hypural plate divided. Mouth small, subterminal; teeth simple, inner (posterior ones) with rounded tips. All head pores small, round, contoured; symphyseal mandibular pores widely spaced. Gill slit short, not quite reaching P base. Head 22.6%, preA 42.1%, disk 8.0% SL. Body, orobranchial cavity, and peritoneum light brown.

**DESCRIPTION.** *Counts:* D 47, A 40, P 26, C 9, vert. 52, radials 3; pores 2-6-7-1, gr 6, pc 4. *Ratios:* HL 22.6% SL, its depth and width about 17.5, bd 18.4, dAo 15.8, preD 27.5, preA 42.1, disk 8.0 (35.3% HL), md 9.9, ma 23.3, da 5.4 (24.0), aAf 13.5, UPL ca 17 (75), notch ray 8.6, LPL 17.5, E 4.3 (19.0), pupil 2.7 (10.7), upper jaw 7.5 (33.3), io 7.9, sn 7.0, gs 5.3 (23.3), pc 5.3%.

Head moderately large, broad, its width and depth equal. Dorsal cephalic outline slowly rounded to slightly projecting snout. Snout fold thick, wide, laterally overlying posterior part of upper jaw. Mouth small, subterminal, lower jaw included. Both jaws short, upper about one-third head length. Teeth in both jaws densely set, symphyseal gap absent. Outer premaxillary teeth simple, conical, slightly blunted; tips of inner teeth more flattened and rounded. Mandibular teeth simple, conical, blunter, and more densely set. Eye small, pupil large, two-thirds eye diameter. Nostril short, tubular, diameter constant. All sensory pores small, round, contoured. Mandibular symphyseal pores widely spaced, distances pm 1-pm 1 and pm 1-pm 2 equal. Suprabranchial pore one. Gill slit small, completely above pectoral base, its ventral end distinctly not reaching the base by a distance about equal to one-third gill slit length. Opercular flap projecting, slightly damaged, but not rounded.

Pectoral fin deeply notched, its upper lobe three-fourths head length, reaching to anal fin origin. Pectoral rays shortening ventrally to 19th ray, the length of which equals about one-half upper P lobe. Lower lobe of seven rays, tips of lower rays are free; the longest ray (fifth from bottom) equals upper lobe length. Pectoral formula binominal, 19+7 = 26. Basal cartilaginous lamina without fenestrae, dorsal half slightly wider. Radials 3 (2+0+1), round; 15 upper pectoral rays supported by two upper and larger radials. Scapular helve well developed. Coracoid without foramen, helve with long tapering lateral ribs from both sides.

Body uniformly elongate. Preanal distance rather large, 4% SL. Skin thin, loose, translucent, prickles absent. Disk flat, moderately large, 35.7% head length, rounded. Marginal ring of disk smooth, covered with translucent skin showing through ventral rays of sucker; anterior lobe small, its out-

line slightly curved. Anus slightly less than three-fourths disk diameter from disk. Distance from mandible to anus 1.7 times greater than anus to anal origin. Pleural ribs absent. Hypural plate divided distally, caudal fin of 8 (4/4) principal rays and 1 ventral procurrent ray. Posteriormost ray of D and A supported by preurostyler vertebra. Interneural of first D ray between fourth and fifth neural spines. Boundary between abdominal and caudal vertebrae distinct. Pyloric caeca short, wider at base.

Body, orobranchial cavity, and peritoneum light brown, stomach not pigmented.

Holotype is a mature female with large eggs to 7.2 mm diameter. About 15 ripe 5–7-mm eggs, some of 2.3 mm diameter, in addition to immature oocytes less than 1 mm.

**MATERIAL EXAMINED.** Holotype, LACM 10747-11, mature female, 154 mm TL, 133 mm SL, *Eltanin* Stn 1509, 58°54'S, 53°51'W, 3817–3931 m, 25–26 Jan. 1966. Pect. girdle N 686.

**DISTRIBUTION.** Holotype caught by bottom trawl at a depth of 3817–3931 m in the western Scotia Sea, about 200 miles to the north of Clarence Island, South Shetland Islands (Ona Basin, GEBCO chart 5.16, Johnson et al. 1983).

**ETYMOLOGY.** The species name is from Latin “parvus” (small) and “porus” (pore).

**COMMENTS.** *Careproctus parviporatus* is similar to the Antarctic shelf species *C. steini* and *C. continentalis* in number of vertebrae and pectoral radials, absence of pleural ribs, small gill slit, and circumoral pores, but it differs from both species in having a slit hypural plate, smaller eye (4.3 vs 5.8–6.7% SL), subterminal mouth, and much deeper habitat (nearly 4 km vs 400–600 m). In addition, *C. steini* has more closely spaced mandibular symphyseal pores and a black dotted peritoneum; *C. continentalis* lacks pyloric caeca; both species lack a scapular helve.

### *Careproctus polarstermi* Duhamel 1992

Figure 22

*Careproctus polarstermi* Duhamel 1992:188, figs. 3a, b (Halley Bay, Weddell Sea). Andriashev 1994a:317, figs. 1–3 (description).

**EXPANDED DIAGNOSIS.** V 51–55 (8–9+43–46), P 28–31, C 10 (1+4/5), radials 3 (2+0+1), round, scapula without helve. HL 25.9–28.0%, preA 35.5–39.1%, disk 7.9–9.8% SL. Pleural ribs absent, hypural plate single, unslit. Teeth simple, minute. Symphyseal mandibular pore pair opening in a common pore. Gill slit above and in front of 1–3 P rays, about 6–8% SL. Anterior lobe of disk nearly absent. Peritoneum dark brown to black.

**DESCRIPTION.** *Counts:* D 47–50, A 41–45, P 28–31, C 10, V 51–55, radials 3, pores 2+5+7+1. *Counts for LACM 11103-1:* D 47, A 41, P 31, C?, vert. 9+43 = 52, radials 3 (2+0+1), pores 2+5+7+1, br. 9. *Ratios* (3 females 63, 58, 45 mm SL): HL 25.9–28.0% SL, its width ca 16–19, bd



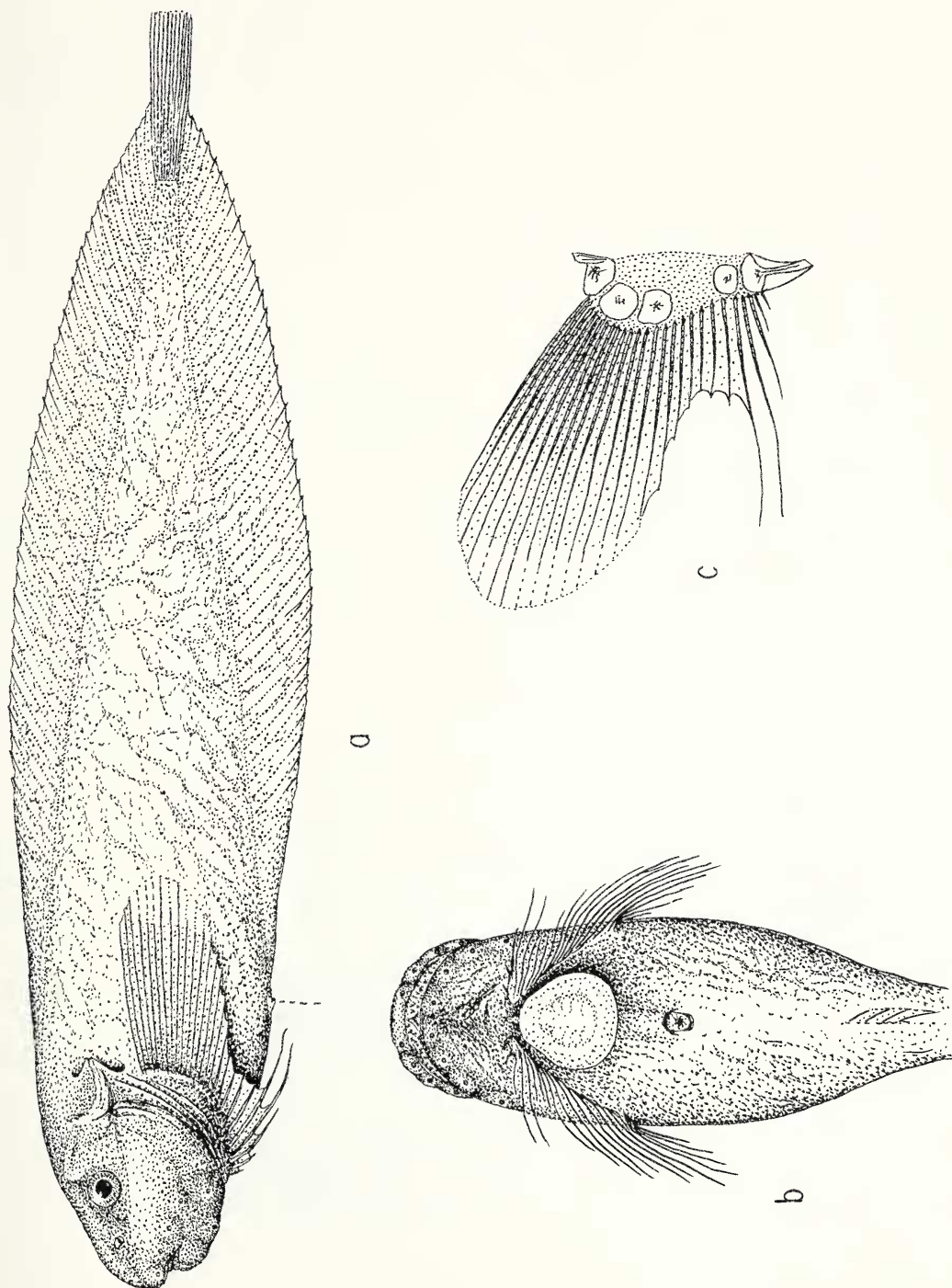


Figure 21. *Careproctus parviporatus* n. sp. Holotype, LACM 10747-11, 133 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.

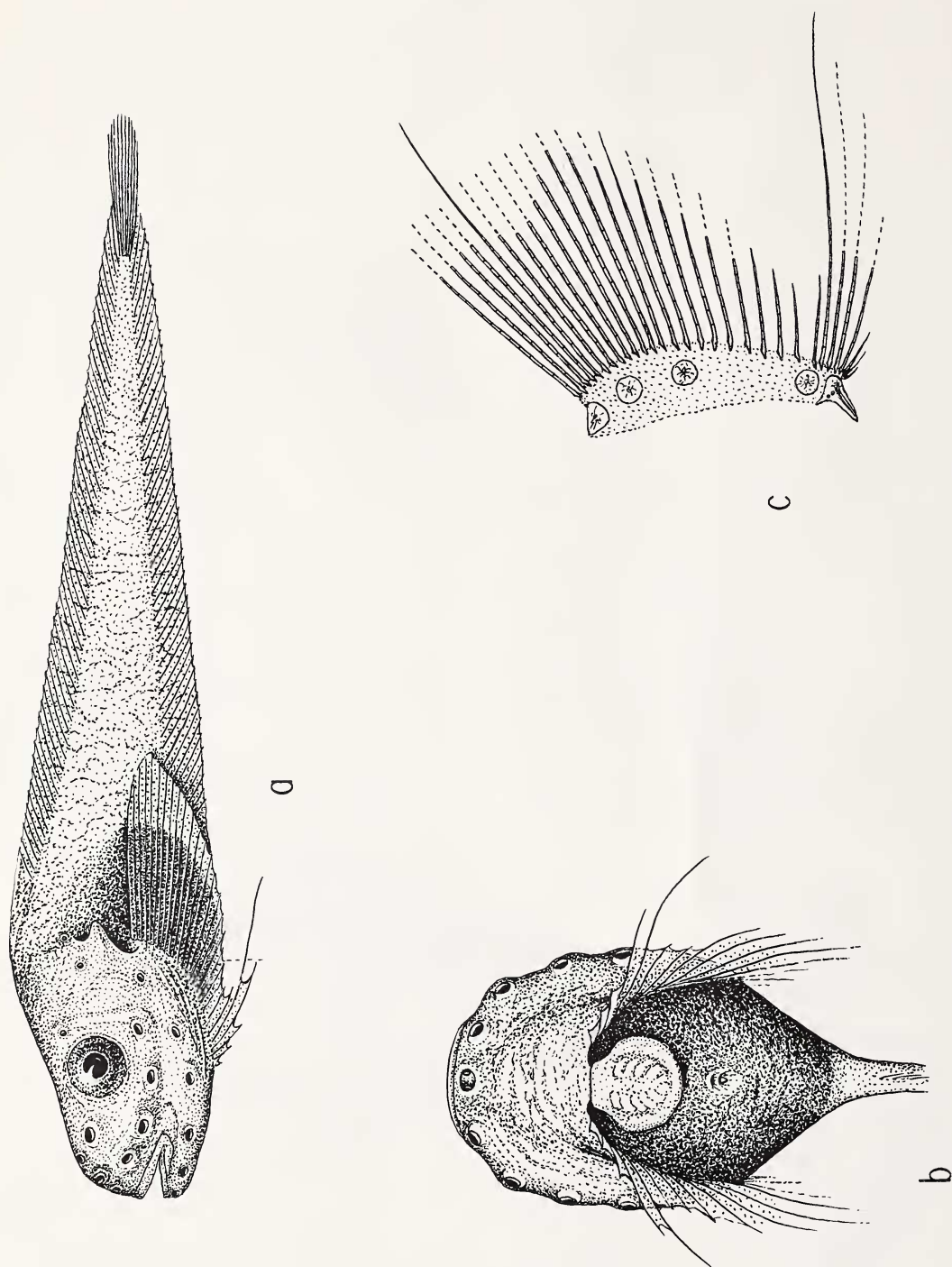


Figure 22. *Careproctus polarsterni* Duhamel. LACM 11142-1, 102 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.

20.3–21.9, preA 35.5–39.1, disk 7.9–9.8 (30–38% HL), md 11.4–12.3, ma 23.8–26.6, da 3.1–3.5 (12.0–13.5), aAf 11.4–13.8, UPL 21.3–23.8 (77–85), NL 12.7, LPL 21.6–23.8, E 6.5–7.1 (25.0–25.8), io 9.2–9.5, gs 6.7–7.9 (26–28%).

Head moderately large, rather wide, rounded, with muscular cheeks; its width about two-thirds body depth. Mouth terminal, horizontal, upper jaw extending posteriorly to below anterior part of pupil, angle of mouth cleft to below anterior margin of eye. Premaxillary teeth simple, minute, conical, with fairly blunt (63 mm SL), or sharp (58 mm SL) points, in oblique rows of up to 5–7 teeth each; symphyseal gap absent in both jaws. Eye not large. Nostril with raised rim, highly set, on a horizontal with upper margin of eye. Circumoral pores large, distinct, round; symphyseal mandibular pore pair smaller, closely spaced, and opening in a single slightly enlarged pore (Fig. 22b). Upper preopercular pore (pm 7) small; postorbital (t 1) and suprabranchial pores minute. Gill slit extending ventrally in front of 1–3 pectoral fin rays. Opercular flap more or less acutely angled, reaching posteriorly to behind pectoral base.

Upper pectoral fin lobe reaching behind anal fin origin, rays becoming shorter ventrally to 21st or 22nd ray, which is half as long as lobe. Fin deeply notched; lower lobe distinct, of 7–8 rays, the longest (seventh from bottom) nearly equal or exceeding upper lobe length. Lowest pectoral ray short, origin below pupil. Pectoral radials 3 (2+0+1), round, interradial fenestra absent. Scapular helve absent; helve of coracoid elongated, with two small foramina and lateral ribs.

Body moderately elongate, tail long, preanal length greater than one-third SL. Abdominal vertebrae 9 (8 in male); parapophyses of 9th vertebra not fused, 10th vertebra with long hemal spine supporting first anal ray. Pleural ribs absent. Length of anterior dorsal fin rays graduated, anteriormost short, not rudimentary; interneural of first ray between fourth and fifth neural spines; free interneurals absent. Disk flat, nearly round; anterior lobe of disk nearly absent, margin weakly sculptured, nearly smooth. Distance from anus to disk about one-third disk diameter. Distance from mandibular symphysis to disk about equal to that between anus and anal fin origin, half as much as distance from mandible to disk. Last dorsal and anal fin rays based on preurostylar vertebra, overlapping anterior third of caudal fin. Hypural plate single, unslit. Caudal fin of 10 (1+4/5) rays. Skin smooth, prickles absent, subcutaneous layer weakly developed. Urogenital papilla of male conical; small genital papilla present in females. Pyloric caeca small, difficult to discern.

Body light, abdomen darkened through body wall by black peritoneum. Oral cavity gray with pale taste buds, gill cavity gray, stomach unpigmented.

The female specimen 58 mm SL caught in mid-February (ZISP 50284) has 12 ripe eggs of about

1.7 mm in diameter in addition to small oocytes 0.5 mm and less. The 45-mm SL LACM specimen has uniformly small oocytes about 0.8 mm in diameter or less.

**MATERIAL EXAMINED.** Four specimens from three stations; radiograph of holotype. Holotype, MNHN 1991-357 (radiograph), adult female, 56.9 mm TL, 51.9 mm SL (measurements from Duhamel 1992), *Polarstern* Stn 249GSN11, 74°37'S, 29°38'W, 701–702 m, 4 Feb. 1989. Other material: LACM 11103-1, female, ca 52 mm TL, 45 mm SL, *Eltanin* Stn 2021, 73°50'S, 178°14'E, 495–503 m, 15 Jan. 1968. Pect. girdle N 704; ISH 64-1991, 43-1991, adult female, 72 mm TL, 63 mm SL, male, TL unknown, 35 mm SL, *Polarstern* Stn 211-91, 69°59'S, 05°08'W, 661–742 m, 10 March 1991, Coll. C. Zimmermann; ZISP 50284 (formerly ISH 43-1991), female, 64 mm TL, 58 mm SL, *Polarstern* Stn 160-91, 70°20'S, 07°03'W, 830–802 m, 16 Feb. 1991, Coll. C. Zimmermann. Pect. girdle N 655.

**DISTRIBUTION.** Previously, *C. polarsterni* was known only from Halley Bay in the northeastern Weddell Sea (74°37'S, 29°38'W) to Princess Martha Coast (69°S, 07°W) at 661–830 m. The "*Eltanin*" specimen is from the northern Ross Sea at 495–503 m, demonstrating that the species probably has a circumcontinental distribution at deep shelf and upper bathyal depths.

**COMMENTS.** The young male has a more elongated body (18.6% SL), shorter preanal length (31.6% SL), and symphyseal mandibular pores not in a single pore although close together. We interpret these to be juvenile character states that change to the adult state with maturation.

*Careproctus polarsterni* differs from all known ribless species occurring near the Antarctic Continent in having the symphyseal mandibular pores opening in a single common pore. This is also characteristic of the Patagonian *C. cactiformis* Andriashev (1990b) and *C. acaecus* Andriashev (1991c), but both species differ clearly in having fewer vertebrae (46–47 vs 51–55), pale peritoneum (vs dark brown to black), and a scapular helve (vs absent).

### *Careproctus profundicola* Duhamel 1992

Figure 23

*Careproctus profundicola* Duhamel 1992:192, fig. 4 (Banzare Banks). Andriashev 1994b:293, fig. 1 (diagnosis).

**EXPANDED DIAGNOSIS.** V 52 (10+42), P 22, C 10 (1+4/5). Pleural ribs absent. Hypural plate single, unslit. Mouth terminal, oblique. Teeth simple. Gill slit oblique, large, about one-ninth SL. Pectoral fin longer than head, deeply notched, rudimentary rays present. Pyloric caeca 12, of similar size. Head 26.0%, preA 43.1%, disk 8.7% SL. Body dark brown with lighter mottling, peritoneum black.

**DESCRIPTION.** *Counts:* D 46, A 41, P 22, C 10, V 52, pores 2-6-7-1, pyloric caeca 12, radials



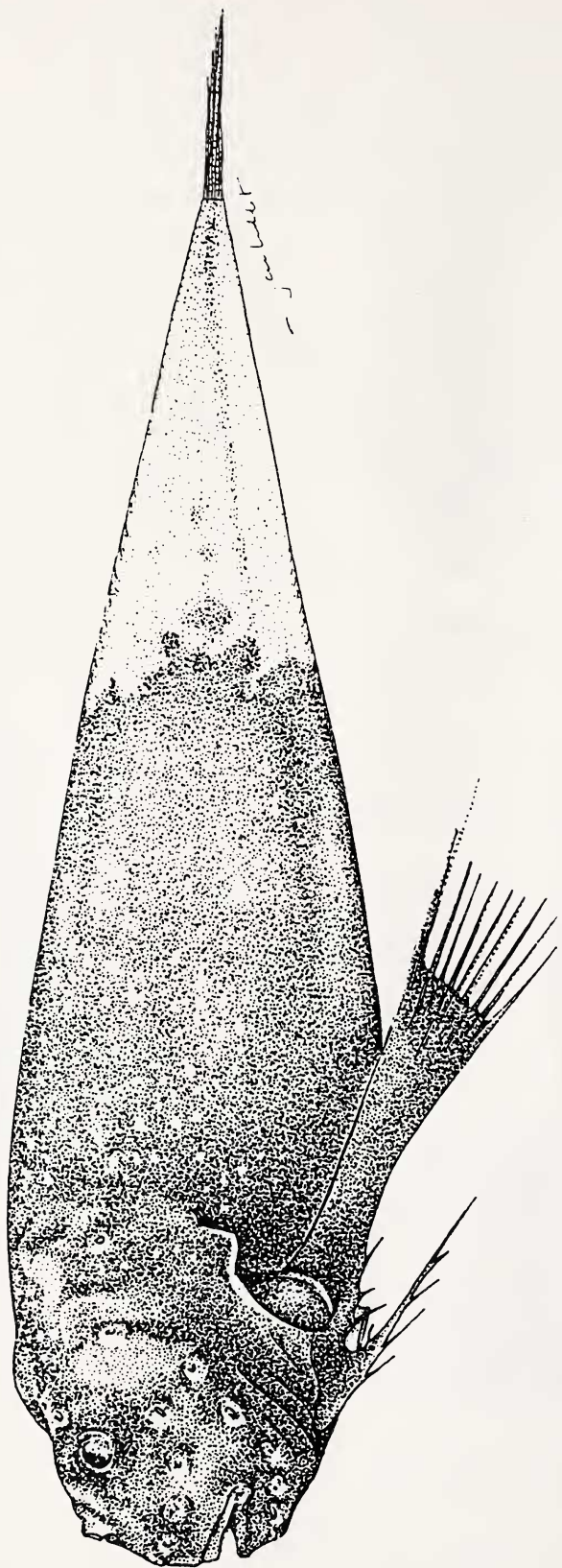


Figure 23. *Careproctus profundicola* Duhamel. Holotype, MNHN 1988-39, 141 mm SL. From Duhamel 1992.

not studied. Ratios: HL 26.0% SL, bd 25.7, dAo 19.2, preD 33.8, preA 43.1, disk length 7.7 (29.7), disk width 7.6, md 11.3, da 3.4 (13.1), eye 5.0 (19.3), gs 11.1 (42.5).

Head moderately large, massive. Dorsal outline of head above eye slightly concave before convex occiput. Snout high, anteriorly nearly vertical. Mouth oblique, moderately large; upper jaw extending to below anterior margin of orbit. Teeth simple, small, conical, arranged in bands of oblique rows. Eye moderately large. Nostril short, tubular, opening equal to diameter of cephalic pores. Circumoral pores rather large, round; symphyseal mandibular pores well spaced; suprabranchial pore single, dorsally located on side of body. Gill slit large, oblique, originating on horizontal with lower margin of eye and extending forward and ventrally to middle of upper pectoral lobe. Opercular bone (judging from figures by Duhamel 1992) long, directed obliquely ventrally.

Pectoral fin long, longer than head and greatly overlapping anal fin origin; pectoral notch deep, of four rays, gradually becoming rudimentary in lowest. All pectoral rays with free tips. Base of pectoral fin, judging from original figure, moved ventrally and forward; therefore, upper pectoral fin ray originates *below* level of posterior margin of preoperculum. Morphology of pectoral girdle unstudied, but probably similar to the related *C. pseudoprofundicola*, i.e., basal cartilaginous lamina with only two round opposing radials (1+0+0+1).

Body rather high, massive, tapering gradually to caudal fin. Abdominal vertebrae 9 and 10 with short haemal spine; longer haemal spine of vertebra 11 supports first anal fin ray; vertebral formula 52 (10+42). Pleural ribs absent. Ventral disk round, its diameter less than one-third HL. Disk to anus distance 43% disk diameter. Conical urogenital papilla present. Pyloric caeca 12, of similar size. Hypural plate single, unslit.

Body and fins dark gray-brown with numerous pale small spots. Orobranchial cavity dark, peritoneum black, stomach and pyloric caeca unpigmented.

**MATERIAL EXAMINED.** Radiograph of holotype, MNHN 1988-39, male, 160 mm TL, 141 mm SL, Marion-Dufresne Stn 15 CP45, 59°24'S, 79°34'E, 1820–2000 m, 21 Jan. 1985, Coll. G. Duhamel.

**DISTRIBUTION.** The only known individual of *C. profundicola* was caught near Banzare Banks at a depth of 1820–2000 m.

**ETYMOLOGY.** The specific epithet is based on the Latin “profundus,” meaning deep, bottomless, referring to the relatively great capture depth.

**COMMENTS.** Our redescription is based on Duhamel’s (1992) data with additions from the radiograph of the holotype. We agree with Duhamel (1992) that *C. profundicola* is closely related to *C. longipectoralis* from the Weddell Sea; it differs in the lower counts (V 52, D 46, A 41, vs V 58, D 53, A 47), larger disk to anus distance (13.1 vs

5.7% HL), its equal-length pyloric caeca, and in body pigmentation (dark brown with lighter mottling vs uniformly bright violet). See below for relationship of *C. profundicola* to *C. pseudoprofundicola*.

### *Careproctus pseudoprofundicola* n. sp.

Figure 24

**DIAGNOSIS.** V 58 (10+48), P 21, C 10 (1+4/5). Radials 2, round, opposing, (1+0+0+1). Pleural ribs absent. Hypural plate single, unslit. Operculum rod-like, long, directed obliquely down. Mouth terminal, oblique. Teeth simple, in narrow bands. Gill slit long, distinctly oblique. Pectoral fin much longer than head, its dorsal ray on a horizontal below preopercle. HL 25.0%, preA 36.7%, disk 6.9% SL. Body dark brown with lighter mottling. Peritoneum black.

**DESCRIPTION.** Counts: D 52, A 46, P 21, C 10 (1+4/5), radials 2, round, opposed (1+0+0+1), V 58 (10+48). Pores 2-6-7-1, gr 12. Ratios: HL 25.0% SL, its depth 20.3, width 17.6, bd ca 20–21, dAo 13.7, preA 36.7, disk 6.9 (27.5), md 8.8, ma 16.2, da 1.0 (4.3), aAf 17.2, UPL 30.4 (123.5), LPL ca 24, eye 4.7 (18.8), gs 11.3 (43.4).

Head rather small, depth slightly exceeding width, cheeks vertical; snout high, blunt. Mouth terminal, oblique, large; upper jaw extending posteriorly to below rear margin of eye, mouth cleft to below middle of eye. Teeth simple, small, in short (2–3 teeth) rows (Fig. 24d); maximum width of premaxillary tooth band ca 3% of its length. Premaxillary symphyseal gap present, mandibular gap absent. Eye moderate. Nostril a short tube. Circumoral pores rather large, round to oval, contoured. Symphyseal mandibular pores well separated but interspace pm 1–pm 1 nearly 0.8 pm 1–pm 2. Post-orbital and suprabranchial pores small; the latter situated well above gill slit, distance from pore to upper gill slit end 1.5 times eye. Gill slit long, distinctly oblique, extending forward and down to ventral side of head below preopercle. Opercle rod-like, straight, long (about 40% HL), directed obliquely down and somewhat posteriorly. Opercular lobe slightly projects at lower end of opercle. Gill rakers numerous, closely spaced.

Pectoral fin long and deeply notched; lower lobe reaching to anal fin origin, upper pectoral lobe far overlapping anterior of anal fin. Upper lobe of 12 thin rays, lower lobe of 5 closely spaced rays; 4 notch rays more widely spaced and much shorter; distinct, thus 12+4+5 = 21 rays. Fin low, nearly entering ventral outline of body; dorsal ray origin *below* posterior edge of preoperculum rather than behind it as usual in family. Lowest (anteriormost) pectoral ray origin below front margin of eye. Basal cartilaginous lamina with two small radials, the first below scapula, the second (smaller) over coracoid (1+0+0+1). Scapular shaft long, coracoid with small foramen and straight helve framed with lateral ribs, anterior wider.

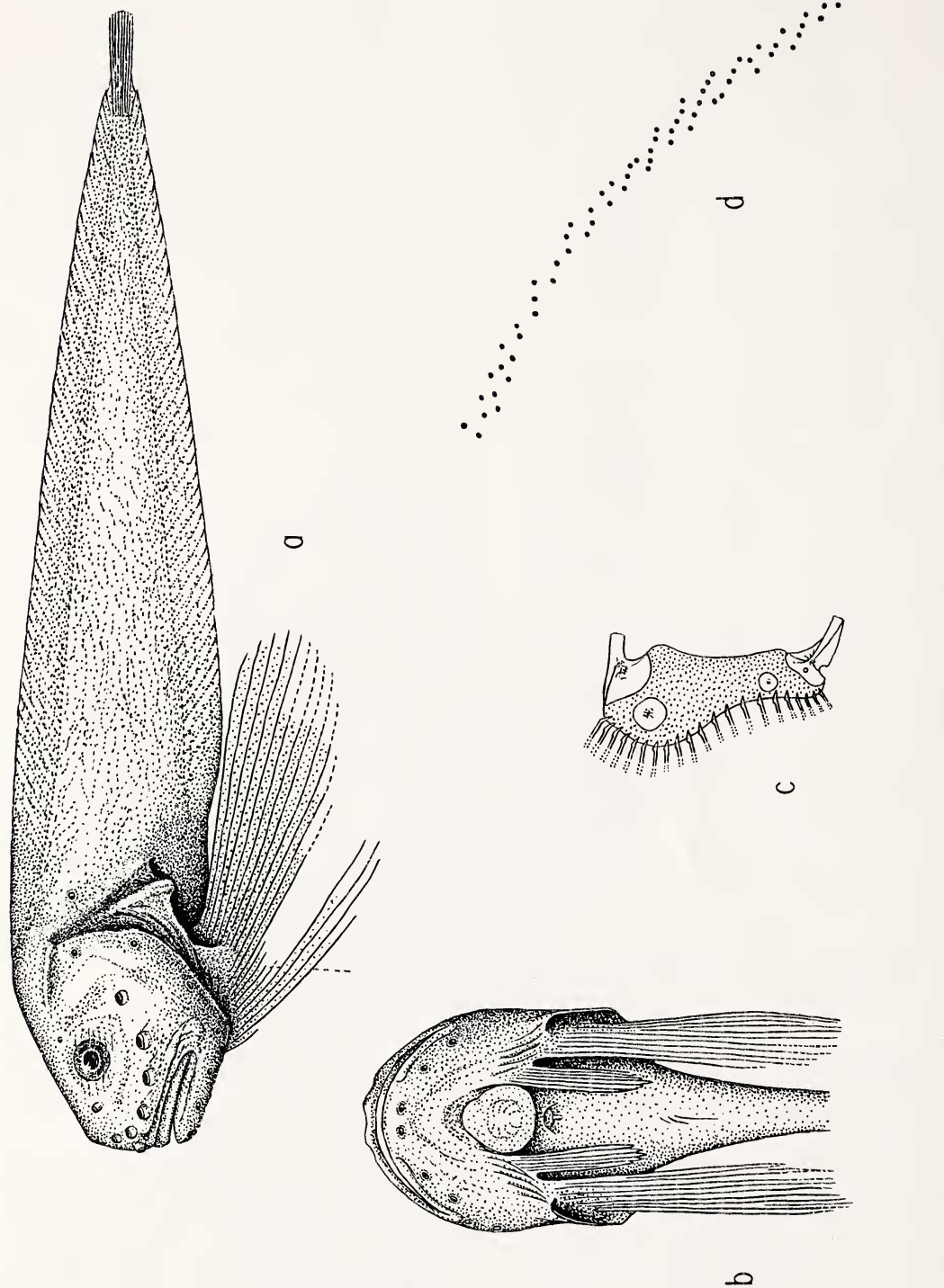


Figure 24. *Careproctus pseudoprofundicola* n. sp. Holotype, LACM 11142-3, 102 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.



Depth of body a little less than head length, tapering postabdominally, attenuate. Skin comparatively thick; numerous traces of small pits now without prickles everywhere on body; only a few small deciduous needles (about 1 mm long) remaining, these located on occiput, dorsal fin, and body side near anal fin origin. Ventral disk small, flat, its marginal ring smooth; anterior lobe of disk with moderately convex front outline. Anus just behind disk. Pleural ribs absent. No sharp boundary between abdominal and caudal vertebrae; haemal spine of 11th vertebra supports interhaemal of first anal fin ray. Interneural of first dorsal ray between fourth and fifth neural spines; two free (rayless) interneurals present anteriorly. Pyloric caeca absent.

Body in alcohol pale; gill cavity dusky, peritoneum black, stomach not pigmented. Tompkins (1977:56) noted "skin dark dusky, grey-brown with light mottling."

**MATERIAL EXAMINED.** Holotype, LACM 11142-3, male, 102 mm SL, *Eltanin* Stn 2091, 75°52'S, 169°53'W, 2049–2089 m, 3 Feb. 1968. Pect. girdle N 666.

**DISTRIBUTION.** The holotype was caught by bottom trawl in the northeastern Ross Sea near the lower boundary of the bathyal zone at 2049–2089 m.

**ETYMOLOGY.** The name of the new species expresses its close similarity to *C. profundicola*.

**COMMENTS.** *Careproctus pseudoprofundicola* is similar to *C. profundicola* but differs in the more numerous vertebrae and D and A fin rays (V 58, D 52, A 46 vs V 52, D 47, A 41); in the larger mouth, the upper jaw of which extends to below the rear margin of eye (to below anterior orbital margin; see Duhamel 1992); in the shorter preanal distance (36.7 vs 43.1% SL; 44.0 measured on a radiograph of the holotype); and in the shallower head (20.3 vs 25.7% SL) and body (depth at A origin 13.7 vs 19.2% SL). Additionally, *C. pseudoprofundicola* has numerous small pits covering the body, but *C. profundicola* apparently does not. Finally, pyloric caeca are absent in the former, but the latter has 12. The new species is also closely related to the Patagonian *C. macranchus* Andriashev (1991a), but the latter has four pectoral radials not two, fewer vertebrae (51–53 vs 58), 7–10 pyloric caeca, and different body coloration (violet-pink vs dark, gray-brown with lighter mottling).

Both *C. pseudoprofundicola* and *C. macranchus* are similar to *C. rimiventris* in several unusual characters: the distinctly oblique position of the gill slit extending to ventral side of the head; the low and anterior position of the pectoral fin, which originates below the preoperculum; the long rod-like opercular bone directed obliquely down; and the dorsal position of the suprabranchial pore.

### *Careproctus rimiventris* n. sp.

Figure 25

**DIAGNOSIS.** V 54 (9–10+44–45), p 22–23, C 9 (1+4/4), pc 16, radials 2, round, opposed

(1+0+0+1). Pleural ribs absent, hypural plate single, unslit. Mouth terminal, oblique. Gill slit large, nearly horizontal, opening directed ventrally. Operculum rod-like, long, directed ventrally. Head 25.6–27.5%, preA 37.6–34.2%, disk 8.4–8.7% SL. Oral cavity light, peritoneum brown-black.

**DESCRIPTION [Paratype].** *Counts:* D 44 [46], A 42 [43], P 22 [23], C 9 [9], V 54 [54], radials 2 [2], pc ca 16, pores 2-6-7-1, gr 10 [10]. *Ratios:* HL 25.6 [27.5] percent SL, its width 18.6 [19.2], bd 23.7 [23.8], bdA 14.8 [12.9], preA 37.6 [34.2], disk 8.4 [8.7], md 9.2 [11.9], ma 18.0 [ca 22], da 1.7 [4.0], aAf 23.0, UPL 24.4, notch ray ca 3, LPL 22.4, eye 3.5 [4.6], sn 8.0 [7.9], io 12.8 [12.1], gs 12.2 [10.6]. UP 95.5% HL, E 13.5 [12.5], sn 31.5 [29], io 50 [44], gs 48 [39].

Head moderately large, cheeks vertical. Dorsal outline of head convex, rounded from occiput to snout. Head width about three-fourths its depth. Mouth terminal, oblique; upper jaw at an angle of about 30° to longitudinal body axis; premaxilla extending posteriorly to below middle of eye, mouth cleft to its anterior margin. Teeth simple, small, sharp, forming rather narrow band of 13–15 short, oblique rows; near symphysis each of about 3–5 teeth (Fig. 25d); maximum width of premaxillary tooth band about 9–10% of its length. Symphyseal gap present in upper jaw, absent in lower. Eye small. Nostril small, pore-like with slightly raised rim. Pores of infraorbital canal moderately large, round, contoured; mandibular pores slightly larger, more oval; symphyseal pores closely spaced, their interspace less than longitudinal pore diameter. Postorbital and suprabranchial pores small, the latter opened high, at a distance equal to two eye diameters from posterior (dorsal) corner of gill slit. Gill slit large, unusual in position, opening ventrally; anterior end behind short opercular flap, continuing forward almost horizontally nearly to below posterior margin of eye (nearly below mid-eye in holotype, but possibly slightly torn). Length of gill slit of holotype about half HL. Operculum rod-like, long (ca 40% HL), straight, directed nearly vertically downward.

Pectoral fin deeply notched; upper lobe extending behind anal fin origin; lower P lobe of 7 rays, longest from bottom only slightly shorter than upper P lobe; notch rays much shortened, slightly more widely spaced; pectoral formula 12+3+7 (13+3+7 in paratype). Upper P ray origin not behind gill cover but below anterior part of preoperculum; entire base of pectoral fin and its girdle horizontal; anteriormost pectoral ray below front margin of eye. Dorsal half of basal cartilaginous lamina much wider. Radials two, round, one below scapula, second above coracoid, (1+0+0+1) in both specimens. Scapular helve short; coracoid with foramen, helve with wide lateral ribs on both sides.

Trunk oviform, tapering post-abdominally, attenuated. Preanal distance slightly more than one-third SL. Skin smooth, prickles absent. Disk small, round, anterior lobe scarcely developed; marginal

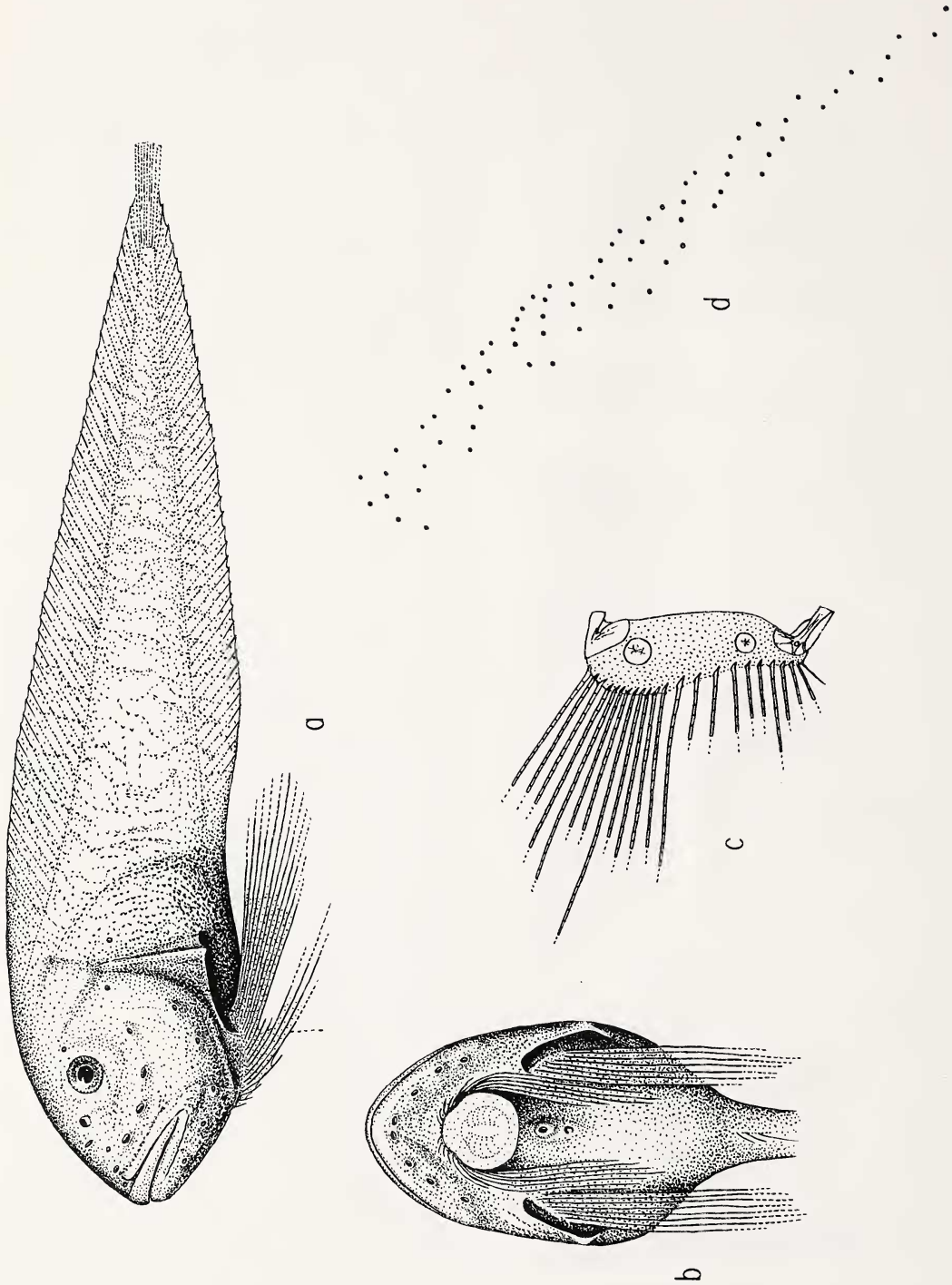


Figure 25. *Careproctus rimiventris* n. sp. Holotype, LACM 11043-6, 86 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.

ring narrow, its width posteriorly about 25% disk center. Posterior disk edge a little bent. Disk margin smooth, not sculptured by sectors, rays transparently visible through thin skin, tips slightly emarginate. Internural of first dorsal fin ray between third and fourth neural spines. Pleural ribs absent. No sharp boundary between abdominal and caudal vertebrae; parapophyses of the two to three last trunk vertebrae connected together forming short haemal spines lengthening posteriorly; ninth vertebra haemal spine rather long (equal to half of first caudal vertebra haemal spine), but first anal rays supported by haemal spine of 10th (11th in the paratype) vertebra. Preurostylar vertebra free from last dorsal and anal fin rays, which are based on next anterior vertebra; rays overlap anterior third of caudal fin. Hypural plate single, unslit. Caudal fin of 8 (4/4) principal rays and 1 dorsal procurent ray (1+4/4). Pyloric caeca numerous (about 16), of similar size, elongate and finger-like, about 6% SL.

Body color in alcohol pale. According to Tompkins (1977:61), "skin light dusky anteriorly, colorless posteriorly; flesh light yellow ochre. Lining of oral and branchial cavities light dusky." Peritoneum brownish-black, stomach not pigmented.

The paratype has uniformly small oocytes no more than 0.7 mm diameter.

**MATERIAL EXAMINED.** Holotype, LACM 11043-6, male, ca 95 mm TL, 86 mm SL, *Eltanin* Stn 1555, 60°08'S, 36°04'W, 1976–2068 m, 15–16 Feb. 1966. Pect. girdle N 678. Paratype, ZISP 50831 (formerly LACM 11043-1), female, ca 60 mm TL, 52 mm SL, caught with holotype. Pect. girdle N 679.

**DISTRIBUTION.** Both specimens of *C. rimiventris* were caught by bottom trawl on the southern Scotia Ridge between South Orkney and South Sandwich Island at 1976–2068 m.

**ETYMOLOGY.** The name of the new species is from the Latin "rima" (slit) and "venter" (belly), referring to the unusual (ventral) position of the gill slit.

**COMMENTS.** *Careproctus rimiventris* differs distinctly from other representatives of the family in that most of its visceral skeleton and the adjacent pectoral girdle and fin are moved ventrally and rotated clockwise with respect to the neurocranium. Unusual features associated with this rotation include the nearly horizontal, ventrally opening gill slit, upper pectoral fin ray origin below the anterior part of the preopercle, vertical long opercle, and the high position of the suprabranchial pore. These characters could justify separation of *C. rimiventris* from *Careproctus* at the generic level. However, there is a species group (*C. pseudoprofundicola* and *C. profundicola*; probably *C. longipectoralis*) that possesses some features intermediate between the rest of the genus and *C. rimiventris* (e.g., the nearly vertical, long, rod-like operculum, a large, oblique gill slit, high position of the suprabranchial pore, and oblique mouth). Furthermore, *C. rimiventris* has some features (absence of pleural ribs, two ra-

dials) in common with a group of species (*C. pseudoprofundicola*, *C. amplexiceps*, *C. acifer*) distributed in Antarctic waters 2000–3500 m deep. Therefore, we do not describe a new genus, although such action may be warranted in the future.

### *Careproctus sandwichensis* n. sp.

Figure 26

**DIAGNOSIS.** V 57 (11+46), P 29, C 11 (1+5+3+2), radials 4, rounded, equidistant. Pleural ribs absent, hypural plate single, unslit but with a thin trace of suture. Eye small, pupil enlarged. Mouth inferior, teeth simple. Circumoral pores rather small; symphyseal mandibular pair widely spaced. Pectoral fin large, moderately notched. Disk margin thin, narrow, translucent. Distance anus to disk about two-thirds disk diameter. Pyloric caeca 10, elongate. Body rather slender, its depth about one-sixth SL. HL 24.5%, preA 40.6%, disk 9.6% SL. Body pale, skin transparent; orobranchial cavity, peritoneum, stomach, and pyloric caeca unpigmented.

**DESCRIPTION.** *Counts:* D 49, A 43, P 29, C 11, V 57, radials pect. 4, gr 7, pc 10, pores 2-6-7-1. *Ratios:* HL 24.5% SL, its depth and width about 16, bd ca 17, bdA ca 12, preD 28.2, preA 40.6, disk 9.5 (38.9), md 9.1, ma 24.3, da 5.9 (24.3), aAf ca 9, uPl 24.0 (98.0), NL 9.7, lPl 18.5, eye 2.1 (8.5), sn 6.3, upper jaw 11.2, C 15.8, gs 5.0 (20.0).

Head moderate, compressed, cheeks vertical, depth and width equal. Dorsal outline sloping from occiput to projecting blunt tip of snout. Mouth inferior, lower jaw extending posteriorly to below middle of eye, oral cleft not reaching below eye. Lower jaws meeting at nearly right angles, slightly rounded at symphysis, included. Teeth simple, small, thin, weakly sharpened, forming band of about eight oblique rows of up to five to seven teeth each in premaxilla; similar in lower jaw. Premaxillary tooth bands forming narrow toothless strip wider anteriorly; gap absent in lower jaw. Eye small, one-twelfth HL, with enlarged pupil. Snout seems elongated and somewhat flattened. Nostril small, pore-like. Circumoral pores rather small, indistinct. Symphyseal mandibular pores widely spaced, situated farther than usual from edge of lower jaw and directed posteriorly; their interspace nearly equal to pm 1–pm 2. Pores pm 4–7 small. First and fifth infraorbital pores small, round, third and fourth oval, opening at ends of wide, fleshy canaliculi. Postorbital and suprabranchial pores slightly raised. Coronal pore absent. Gill slit completely above pectoral fin base, length about one-fifth HL, origin somewhat above eye level, directed nearly vertically down. Opercular lobe indistinct, formed by junction of horizontal and descending edges of gill cover.

Pectoral fin large, moderately notched, reaching to behind anal fin origin; its rays shortening gradually ventrally to 21st, length of which is almost 40% that of upper lobe. Lower pectoral lobe of



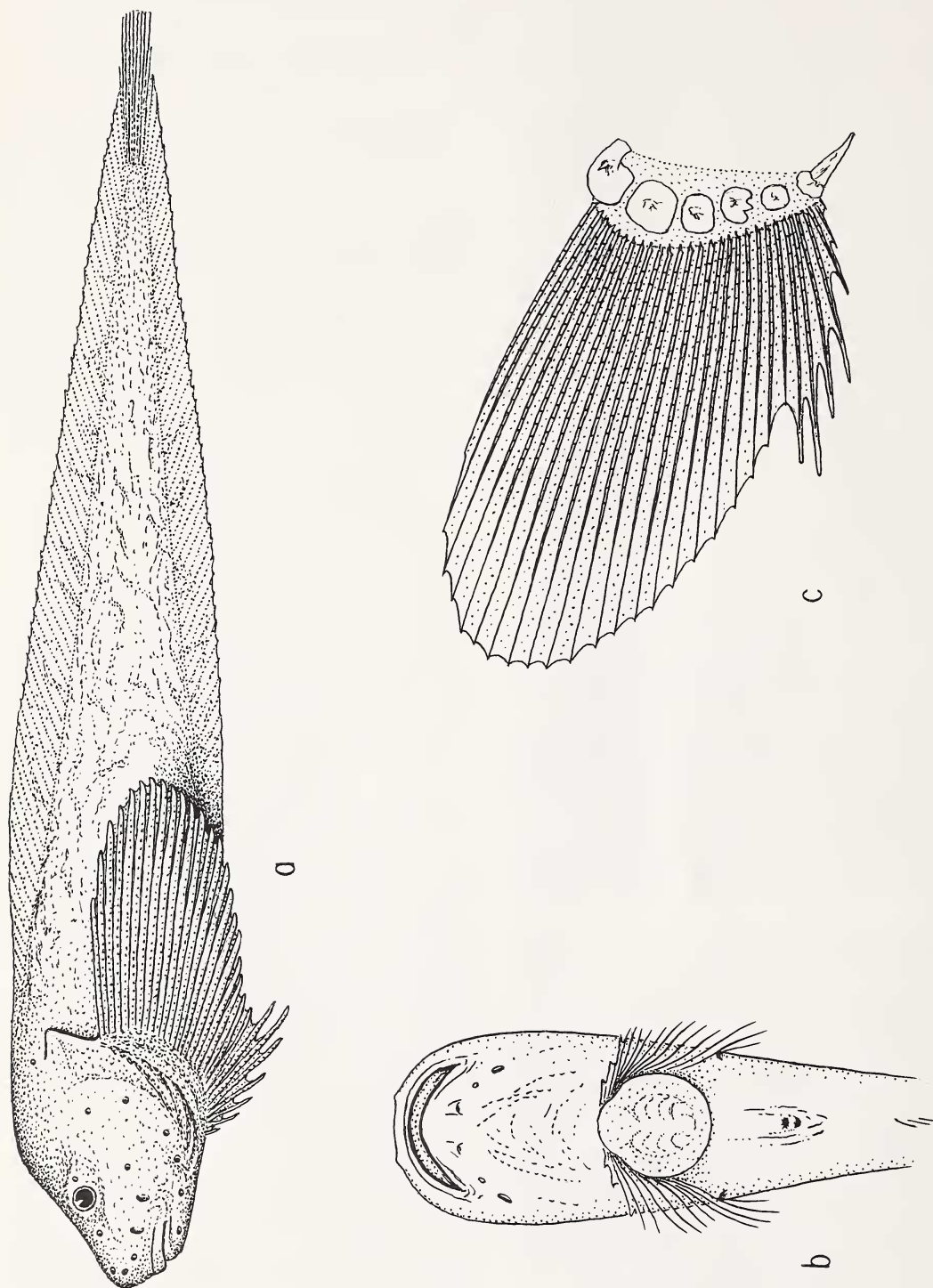


Figure 26. *Careproctus sandwichensis* n. sp. Holotype, LACM 10553-1, 101 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.

seven rays, short, its longest ray (sixth from bottom) 1.9 times length of notch ray. Basal cartilaginous lamina oval, narrowing ventrally. Pectoral radials 4, equidistant, close together (Fig. 26c). Third radial somewhat deformed, fourth smaller. Scapula with wide, short helve, coracoid helve straight, long, lateral ribs absent.

Body elongated, especially postabdominally, depth about one-sixth SL. Last dorsal fin ray not quite reaching mid-caudal. Anterior dorsal rays not markedly shortened, interneural of first dorsal ray between neural spines 6 and 7; one free (rayless) interneural anteriorly. Pleural ribs absent. Ventral disk weak, thin, rounded, margin narrow, its skin thin and translucent, revealing supporting rays; margin curled up around center. Anus distance from disk about two-thirds disk diameter. Urogenital papilla absent, but a small, round, "pancake-like" skin thickening present. Hypural plate single, widened distally but unslit; suture barely visible. Caudal fin long, about 16% SL. Caudal fin rays arranged distinctly: one dorsal procurent ray, 8 (5+3) principal rays and two ventral procurent rays below. Pyloric caeca 10, thick, elongate, 7–9% SL.

Skin on occiput and back damaged; thin, transparent, subcutaneous layer absent. Whole body, orobranchial cavity, peritoneum, stomach, and pyloric caeca completely unpigmented.

**MATERIAL EXAMINED.** Holotype, LACM 10553-1, male, 114 mm TL, 101 mm SL, *Eltanin* Stn 591, 55°07.5'S, 25°59'W, 5435–5453 m, 19 Apr. 1963. Pect. girdle N 693.

**DISTRIBUTION.** The only specimen was caught by bottom trawl (Blake trawl) in the northern South Sandwich Trench at 5435–5453 m. Thus, *C. sandwichensis* is the deepest known species of *Careproctus*.

**ETYMOLOGY.** The latinized name, "sandwichensis," from the species occurrence in the depths of the South Sandwich Trench.

**COMMENTS.** *Careproctus sandwichensis* somewhat resembles *Notoliparis macquariensis* Andriashev 1978 in general habitus, a small eye, fully unpigmented body and cavities, and four pectoral radials. However, *C. sandwichensis* lacks the additional pores characteristic for the genus *Notoliparis* (an odd coronal, paired postcoronal, and two temporal pores in addition to the postorbital and suprabranchial pores). *Careproctus sandwichensis* is also somewhat similar to another deep-living species of this genus, *C. leptorhinus*, but the latter differs distinctly in its larger eye (18 vs 8.5% HL), tricuspid rather than simple teeth, black peritoneum, and number and arrangement of pectoral radials (two oppositely arranged vs four equidistant).

### *Careproctus scaphopterus* n. sp.

Figure 27

**DIAGNOSIS.** V 56–60 (10–11+45–50), P 26–29, C 10 (1+4/4+1), radials 4, round, equidistant.

Two pair of thin, curved, pleural ribs. Hypural plate partly or completely divided. Mouth terminal, teeth simple. Circumoral pores small. Gill slit above P base. Pectoral fin upper lobe of 20–22 rays, wide, spade-like; pectoral unnotched. HL 20–26%, preA ca 41%, disk oval, 7.2–8.8% SL. Peritoneum dark brown to black.

**DESCRIPTION.** [Paratypes SL 225, 140, 125 mm]. *Counts:* D 54 [52,51,52], A 44 [44,44,47], P 29 [29,26,26], C 10 [10,9,10], V 60 [58,56,59], radials 4, gr 8–10, pc 10–19, pores 2–6–7–1. *Ratios:* HL 25.6 [20.4,25.9,24.9] % SL, its depth 18.3 [18.6,20.7,19.4], its width ca 15 [13–14], bd 18.8 [18.6,20.6,19.8], preD 25.9, preA 40.9 [–,41.4,35.5], disk 8.8 [7.2,8.6,8.1], disk width 6.7 [–,6.2,5.6], UPL 30.1 [20.0,27.9,25.0], md 11.8 [–,11.0,10.3], ma 23.9 [–,27.6,21.9], da 4.0 [–,4.0], aAf 12.2, E 3.0 [3.3,3.4,4.0], gs ca 7.6% SL. UPL 117 [98,107,100], E 12.0 [16.3,12.9,16.2], gs ca 30%.

Head moderately large, its width a little less than depth; snout high, blunt, barely projecting. Mouth terminal, horizontal, cleft extending to below anterior margin of eye. Teeth simple, arranged in numerous short, oblique rows of up to 6 teeth each; premaxilla with narrow tooth band, maximum width about 9% of its length (from paratype 225 mm SL). Symphyseal gap present in each jaw. Eyes damaged, small. Nostril pore-like, rim raised. Circumoral pores small, round, contoured. Mandibular symphyseal pore pair widely spaced, interspace pm 1–pm 1 equal to or slightly less than pm 1–pm 2. Now, all specimens have torn gill membranes, but in undamaged specimens examined by Tompkins (1977), slit was completely above P base. Length of gill-slit no more than one-third head length (Tompkins 1977). Opercle moderately large, crescent shaped. Opercular lobe large, extending nearly to behind pectoral base.

Pectoral unnotched, form characteristic; upper 20–22 rays forming a wide shovel-form lobe, length exceeding or equaling that of head; lower rays shorter and thinner, not forming a lower lobe. Pectoral girdle with wide cartilaginous lamina, smoothly narrowing to its lower quarter. Fenestrae absent. Radials 4, round, large, equidistant, and closely set. Scapular helve sharply widened distally; coracoid helve gradually widening ventrally.

Body moderately elongated, its depth a little less than one-fifth SL. Anteriormost dorsal fin ray rudimentary, its interneural between fifth and sixth neural spines. Two pair of thin, curved pleural ribs; distance from mandibular symphysis to anus about half that from anus to anal fin origin. Ventral disk oval, its width about three-fourths its length. Disk margin unsculptured, narrow, smoothly forming a feeble anterior lobe. Disk covered with smooth, thin skin revealing skeleton of disk. Distance of anus to disk a little less than one-half disk length. Hypural plate variable: in holotype and one paratype (140 mm SL), a distal slit continued as a suture proximally; in two paratypes, completely divided by a narrow slit. Caudal fin of 10 rays in holotype

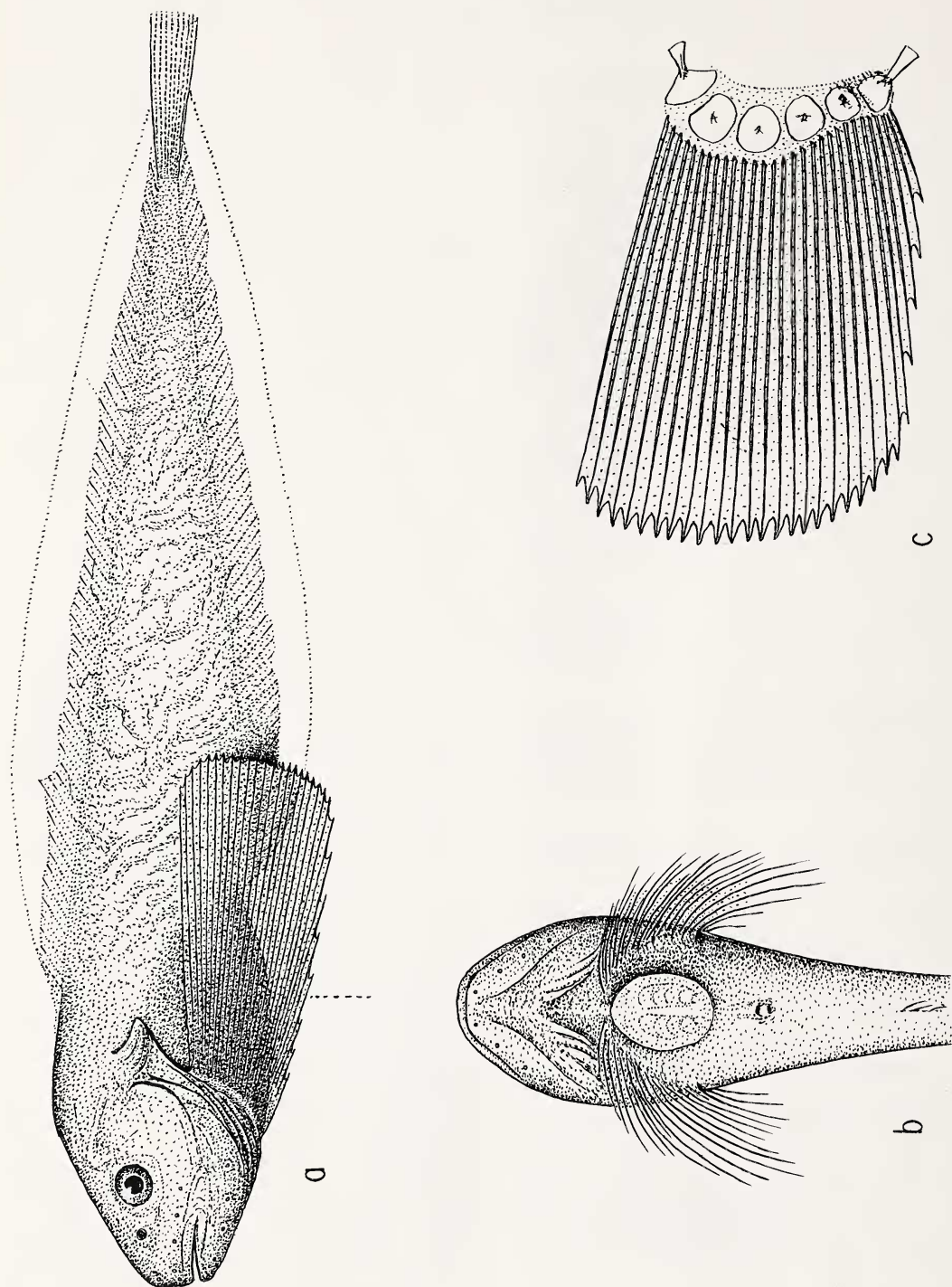


Figure 27. *Careproctus scaphopterus* n. sp. Holotype, LACM 10799-2, 164 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.



and two paratypes, of 9 in 140-mm SL paratype. Skin without prickles. Pyloric caeca 10–19, slender, finger-like, more or less similar in size.

In adults, “skin dusky to nearly black anteriorly, transparent and dusky to opaque white or pinkish caudally” (Tompkins 1977:33), peritoneum black; in juveniles, body color light, peritoneum dark brown.

The adult female has ripe eggs of up to 5.8 mm diameter.

**MATERIAL EXAMINED.** Four specimens from four stations. Holotype, LACM 10799-1, female, 164 mm SL, *Eltanin* Stn 1025, 62°14'S, 40°33'W, 3250–3285 m, 24 March 1964. Pect. girdle N 691. Paratypes: LACM 10772-2, female, 225 mm SL, *Eltanin* Stn 1537, 55°10'S, 39°46'W, 2886–3040 m, 8 Feb. 1966. Pect. girdle N 690. LACM 10504-2, female, 140 mm SL, *Eltanin* Stn 474, 56°25'S, 44°52'W, 3486 m, 13–14 Feb. 1963. Pect. girdle N 692. ZISP 50791 (formerly LACM 10560-2), immature female, 124 mm SL, *Eltanin* Stn 608, 60°11'S, 22°14'W, 3569–3623 m, 6–7 May 1963. Pect. girdle N 694.

**DISTRIBUTION.** *Careproctus scaphopterus* was caught by bottom trawls in the Scotia Sea (2886–3486 m), south of the South Orkney Islands (3250–3285 m), and east of the South Sandwich Islands (3569–3623 m).

**ETYMOLOGY.** The species name is formed from the Greek words “scapha” (spade) and “pteron” (feather, wing).

**COMMENTS.** The description is primarily based upon immature females because the largest of our specimens, a female of 251 mm TL, is poorly preserved, its two anterior vertebrae are somewhat abnormal, and its head and pectoral fins are relatively shorter than in the smaller specimens (about 20% SL).

*Careproctus scaphopterus* is closely related to *C. sandwichensis* but differs distinctly in having two pair of pleural ribs, a larger eye (3.0–4.0 vs 2.0% SL), unnotched pectoral fin (vs notched), and dark pigmented peritoneum (dark brown to black vs light).

### *Careproctus steini* Andriashev and Prirodina 1990

Figure 28

*Careproctus steini* Andriashev and Prirodina  
1990a:6, fig. 3, South Shetland Island.

**EXPANDED DIAGNOSIS.** D 45–46, A 39–41, P 31–32, C 10 (1+4/5), V 50–51 (8–9+42), radials 4 (3), rounded, unnotched. Scapula without helve; pleural ribs absent, hypural plate single, unsplit. Mouth terminal, teeth shouldered. Mandibular symphyseal pores small, round, closely set. Gill opening small (4.1–4.3% SL), completely above pectoral base. Anus almost immediately behind disk. Pyloric caeca probably absent, internal organs in poor condition. Head 25.0–26.4%, preA 36.1–

37.9%, disk 8.3–8.8% SL. Peritoneum pale, black dotted.

**MATERIAL EXAMINED.** Three specimens from two stations. Holotype, ZISP 49347, female, 80.5 mm TL, 72 mm SL, *Academic Knipovich*, Stn 741, 60°58'S, 54°41'W, 570–582 m, 1 Feb. 1967, Coll. Yu. E. Permitin. Pect. girdle N 492. Paratypes, ISH 200-87, female, 83 mm TL, 74 mm SL, male, 69 mm TL, 61 mm SL, *Polarstern* Stn 230, 61°02'S, 54°44'W, 429–434 m, 15 Dec. 1987, Coll. K.-H. Kock.

**DISTRIBUTION.** Known from upper slope depths near the tip of the Antarctic Peninsula.

**COMMENTS.** *Careproctus steini* is closely related to *C. continentalis*; see the discussion of the latter.

### *Careproctus tricapitidens* n. sp.

Figure 29

**DIAGNOSIS.** V 57 (8+49), P 25, C 8 (4/4), radials 4, round, equidistant. One pair of short pleural ribs, hypural plate single, unsplit. Mouth inferior; teeth with three tubercular lobes. Symphyseal mandibular pores well spaced. Gill slit above P base. Head 20.7%, preA 39.1%, disk 7.8% SL. Peritoneum black.

**DESCRIPTION.** *Counts:* D 52, A 46, P 25, C 8, V 57, radials 4, gr 6, pores 2-6-7-1, pc 7. *Ratios:* HL 20.7% SL, depth 15.6, width about 13, bd 17.2, bdA 12.1, preA 39.1, disk 7.8 (37.7% HL), md 8.1, ma 21.3, da 5.7 (27.5), aAf 13.8, UPL 14.7 (71), notch ray 7.0, LPL 12.5, eye 6.1 (29.4), sn 5.1 (24.5), io 7.1, gs 4.1 (20.0).

Head rather small, about one-fifth SL, dorsally sloping to bluntly rounded snout projecting slightly. Mouth inferior; upper jaw extending posteriorly to below anterior margin of eye. Teeth distinctly trilobed, with broadly rounded, tubercle-like points of similar size or larger in the middle. Premaxillary and dentary teeth in 8–9 oblique rows of up to 4–6 teeth each, forming band of maximum width equal to about 19–20% of its length (Fig. 29d). Symphyseal gap absent from both jaws. Eye large, nostril pore-like, small. Circumoral pores small, round; symphyseal mandibular pores well spaced (Fig. 29b), suprabranchial pore single. Gill slit well above pectoral fin base, opercular flap small, rounded, in mid-gill slit.

Pectoral fin of 25 (18+7) rays, reaching to anal fin origin; notch moderate but distinct, notch rays half as long as upper pectoral lobe; lower lobe of seven rays, the longest (fifth to sixth from bottom) a little shorter than upper P lobe. Lowermost P ray origin below anterior half of eye. Basal cartilaginous lamina with four rounded, nearly equidistant radials, upper largest. Scapular helve comparatively long, posterior lamellar rib at its base (Fig. 29c). Coracoid helve long, thin, with proximal lamellar ribs; foramen present.

Body elongate, preanal distance moderate. Skin thin, movable, prickles absent. Disk small, margin

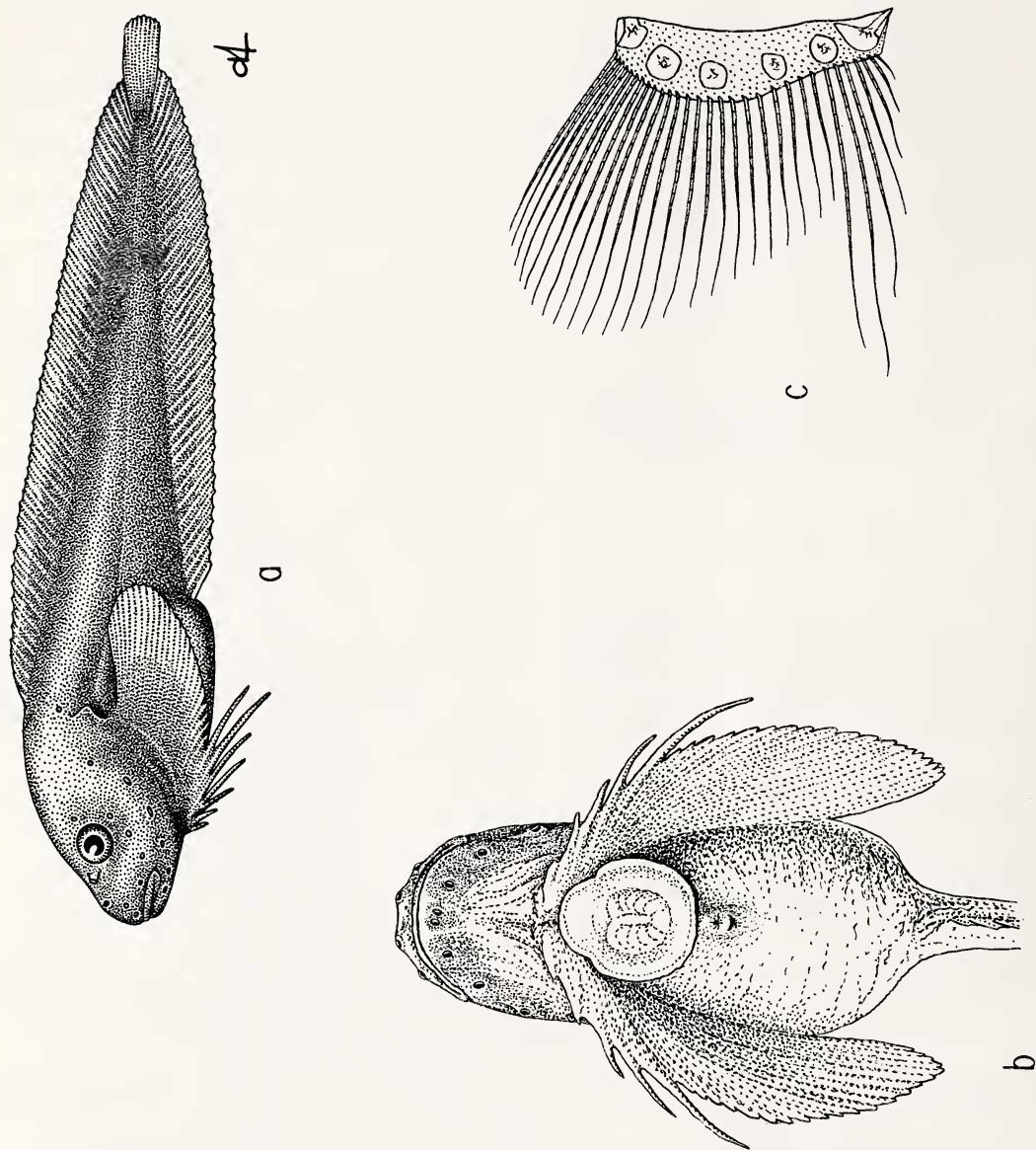


Figure 28. *Careproctus steini* Andriashev and Prirodina. Holotype, ZISP 49347, 72 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle.

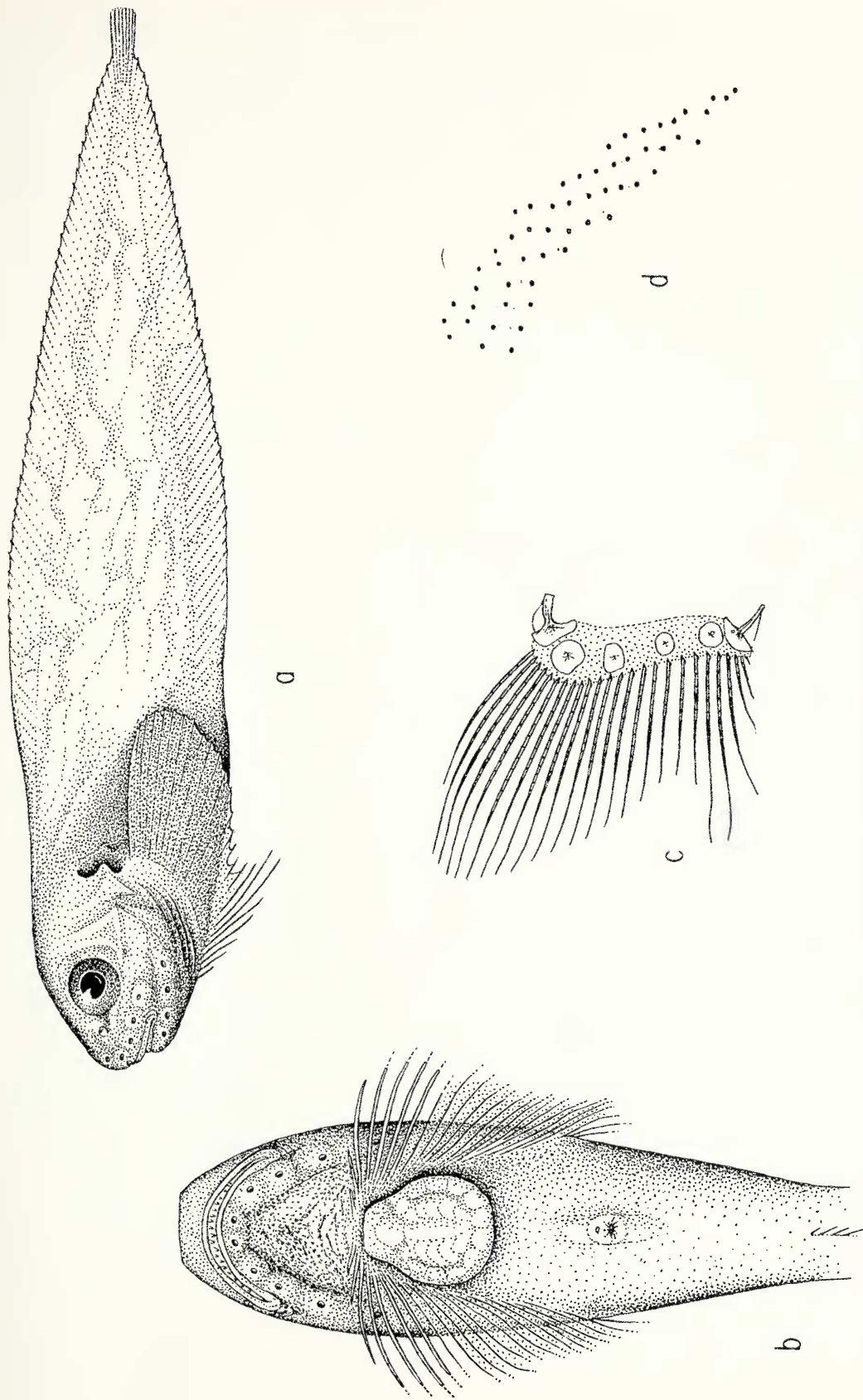


Figure 29. *Careproctus tricapitidens* n. sp. Holotype, LACM 10434-7, 128 mm SL: a, lateral view; b, ventral view; c, pectoral fin and girdle; d, premaxillary tooth pattern.



narrow, segment tubercles slightly sculptured. Anus much nearer to anal fin origin than to mandibular tip. First interneural of dorsal fin between fourth and fifth neural spines. Parapophyses of last (eighth) abdominal vertebra with a pair of short posteriorly directed ribs. Hypural plate single, unslit. Last dorsal fin ray broken, last anal fin ray reaching middle of caudal fin. Preurostylar vertebra free, not bearing posterior dorsal and anal fin rays. Caudal fin of 8 (4/4) rays, procurent rays absent. Pyloric caeca seven, thick, elongated, about 7–9.5% SL.

In alcohol, body pale, peritoneum black. "Skin transparent, light anteriorly, dusky posteriorly; flesh sand to light yellow ochre. Lining of oral and branchial cavities dark dusky" (Tompkins 1977: 101). Stomach and pyloric caeca unpigmented. One ovary contains 20 nearly ripe eggs up to 6.7 mm diameter and many oocytes less than 1 mm.

**MATERIAL EXAMINED.** Holotype, LACM 10434-7, female, 137 mm TL, 128 mm SL, *Eltanin* Stn 428, 62°39'S, 57°46'W, 662–1120 m, 5 Jan. 1963. Pect. girdle N 670.

**DISTRIBUTION.** The only specimen known was caught by a bottom trawl (Blake trawl) in the Bransfield Strait at a depth of 662–1120 m.

**ETYMOLOGY:** From the Latin "tri" (three), "capitus" (head), and "dens" (teeth).

**COMMENTS.** *Careproctus tricapitidens* is in the incomplete-ribbed *Careproctus* group; only one pair of short pleural ribs is present on the last abdominal vertebra, as in the Patagonian *C. aureomarginatus* Andriashev (1991c) and *C. atrans* Andriashev (1991c). *Careproctus tricapitidens* differs from both in trilobed tubercular teeth and single unslit hypural plate. In addition, *C. aureomarginatus* has more pectoral and caudal-fin rays (P 35, C 12 vs P 25, C 8), two suprabranchial pores (one in *C. tricapitidens*), and a longer head (32.1 vs 20.7% SL). *Careproctus atrans* is also easily distinguished from *C. tricapitidens* in having fewer vertebrae and dorsal and anal fin rays (V 47, D 44, A 38 vs V 57, D 52, A 46) and the dark black-brown body.

### *Careproctus vladibeckeri* n. sp.

Figure 30

**DIAGNOSIS.** V 52 (10–11+41–42), P 28–29, C 10 (1+4/4+1), radials 2, round, opposed. Pleural ribs absent. Mouth terminal, teeth simple. Symphyseal pores not widely spaced. Gill slit above and in front of 1 or 2 pectoral fin rays. Disk a little shorter than wide. Distance from anus to disk equals about two-thirds disk diameter. Pyloric caeca 10–12, elongated. HL 28.3–29.6% SL, preA 43.7–46.2%, disk 8.3–11.5%. Body light brown, peritoneum brown-black.

**DESCRIPTION** [Paratypes SL 228, 133 mm]. *Counts:* D 47 [46,48], A 40 [40,40], P 28 [29,28], C 10 [1+4/4+1], V 52 [52,52] radials 2 [2], pores 2–6–7–1, gr 8 [6,7], pc 10 [10,12]. *Ratios:* HL 28.9

[29.6,28.3] % SL its depth and width ca 21.5, bd 21.5 [23.8,24.6], bdA 17.9 [20.2,19.5], preA 46.2 [44.6,43.7], disk 8.3 [10.5,9.4], disk width 8.7 [11.2,–], md 14.2 [ca 17.5,–], ma 26.6 [–,29.2], da 5.0 [–,5.6], aAf 13.9 [–,15.0], UPL 17.3 [18.4,19.2], NL 10.0, LPL 16.8 [20.4,–], E 4.5 [–,4.8], uj 13.4 [11.4,11.9], sn 10.3 [8.9,8.8], gs 6.8 [6.4,–]. In percent HL: disk 28.6 [36.6,34.0], UPL 60 [59,68], E 15.6 [–,17.0], gs 20.0 [21.4,–].

Head large, wide, depth about equal to width; dorsal outline of head rounded from occiput to high, unprojecting snout. Mouth terminal, horizontal. Upper jaw extending posteriorly to below middle of eye, oral cleft to below anterior margin of eye. Teeth simple, fairly blunt, conical to canine; upper jaw with numerous oblique, curved rows of up to five teeth each near symphysis. The direction of these differs between anterior and posterior parts of jaw. Greatest width of tooth band equals about 16% of its length. Arrangement of teeth in lower jaw similar. Symphyseal gap present in each jaw. Eye small, pupil nearly equal to half eye diameter. Nostril pore-like, rim raised, its diameter slightly larger than nasal pores, but smaller than second infraorbital pore. Circumoral pores moderately large, distinct, round, contoured. Symphyseal mandibular pore pair a little smaller than pore pm 2 and rather closely spaced; interspace between them (pm 1–pm 1) half that of pm 1–pm 2. Suprabranchial pore single. Gill slit vertical, in holotype, originating on horizontal level with mid-eye and extending down in front of second pectoral ray; in paratypes, completely above pectoral base. Opercular flap wide, damaged, probably rounded.

Pectoral fin of 29 (28) rays (21–22+7), deeply notched; rays become shorter ventrally to 21st (22nd) ray, length of which is slightly longer than one-half that of upper lobe. Lower lobe of seven rays, the longest (fifth from bottom) equal to or slightly longer than upper lobe. Basal cartilaginous lamina of pectoral girdle with two radials, round, opposed, dorsal one larger. Helve of scapula slightly widened distally; helve of coracoid framed by long, straight ribs, posterior one wider than anterior. Pectoral girdle in LACM 11351-3 probably abnormal in having an additional small, underdeveloped third radial present.

Body moderately elongate, trunk large, distinctly longer than one-third SL. Abdominal and caudal vertebrae distinct, 11+41 (10–11+41–42). Pleural ribs absent. First dorsal ray not rudimentary, its interneural between fourth and fifth vertebrae. Disk flat, wide, its width slightly exceeding length; margin rather wide, unsculptured, smoothly enters a narrow anterior lobe; without anterior lobe, disk shape is transversely oval. Distance from anus to disk is about equal to two-thirds its length. Caudal fin damaged in both holotype and LACM 11351-3; hypural probably not divided. In adult female, a short slit present in anterior hypural, continuing distally as a suture. Caudal of 10 rays, but one additional 11th primary ray present in LACM 11460-

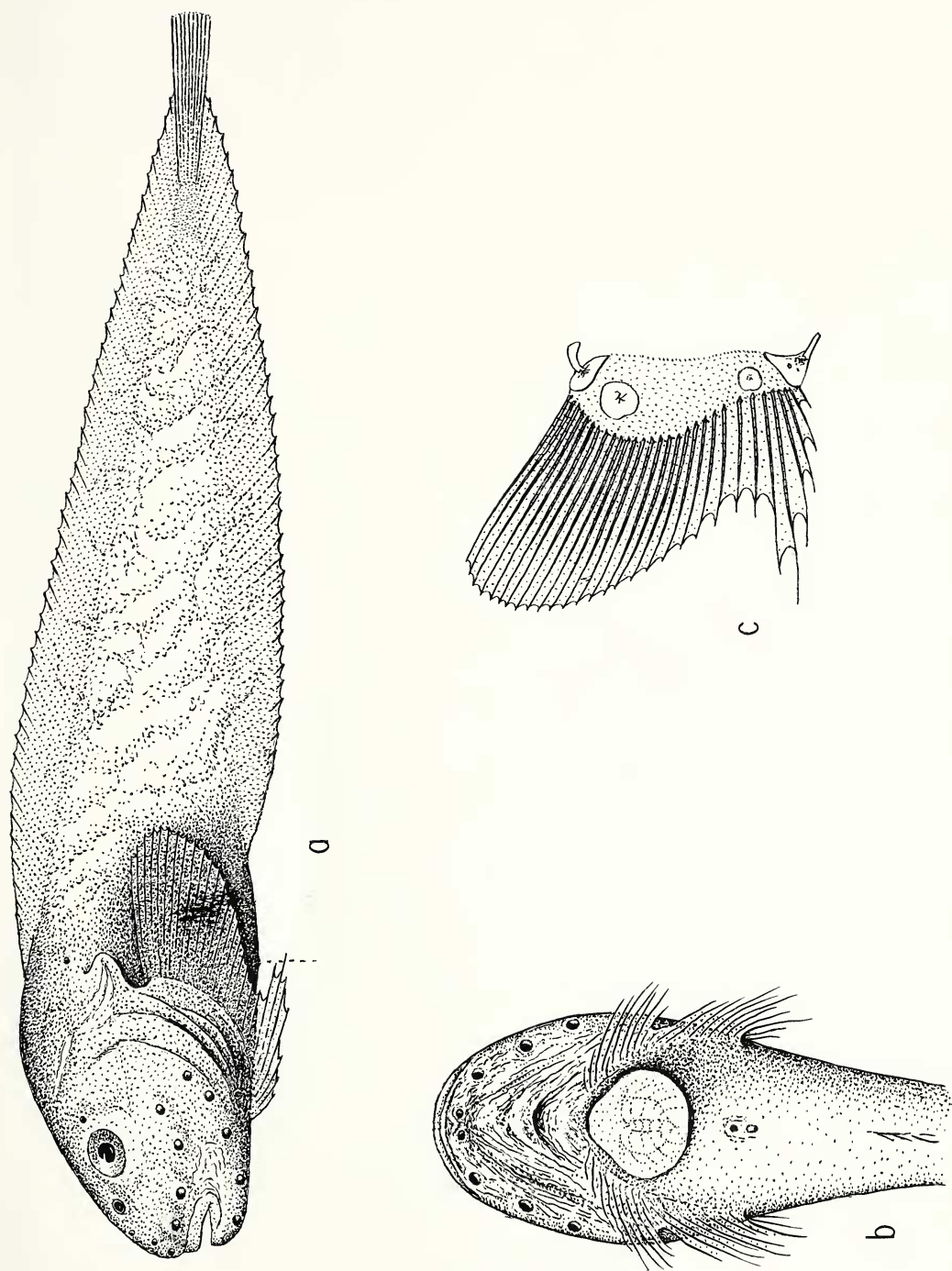


Figure 30. *Careproctus vladibeckeri* n. sp. Holotype, LACM 10526-1, 173 mm SL: a, lateral view; b, ventral view; LACM 11460-1: c, pectoral fin and girdle.

1. Partly skinned, remaining skin thin, smooth, lacking any traces of prickles. Pyloric caeca 10–12, elongated, about 7–8% SL.

Skin remaining on body and fins light brown, orobranchial cavity pale, peritoneum brown-black.

The adult female had ripe eggs up to 4.1 mm diameter at the beginning of February.

**MATERIAL EXAMINED.** Three specimens from three stations. Holotype, LACM 10526-1, male, 199 mm TL, 173 mm SL, *Eltanin* Stn 529, 63°00'S, 49°20'W, 2653–2941 m, 3–4 March 1963. Pect. girdle N 688. Paratypes: LACM 11460-1, female, 267 mm TL, 228 mm SL, *Eltanin* Stn 2110, 74°07'S, 174°58'W, 2350 m, 8–9 Feb. 1968. Pect. girdle N 705. LACM 11351-3, female, TL unknown, 133 mm SL, *Eltanin* Stn 1867, 70°56'S, 172°04'W, 2273 m, 13 Jan. 1967. Pect. girdle N 687. Other material, ZISP 50830 (formerly LACM 10729-1), female, 91 mm SL, *Eltanin* Stn 484, 58°54'S, 44°31'W, 952 m, Guevara Seamount, Scotia Sea, 16–17 Feb. 1963.

**DISTRIBUTION.** Probably circumantarctic; holotype was caught in the northernmost Weddell Sea southwest of South Orkney Island at 2653–2941 m, and both paratypes are from the northern Ross Sea at 2350–2273 m.

**ETYMOLOGY.** The new species honors Vladimir Edward Becker (1925–1995), author of the excellent *Myctophid Fishes of the World Ocean*, and his contributions to ichthyology from many expeditions to the Pacific, Indian, and Atlantic Oceans.

**COMMENTS.** The description is based primarily upon the better-preserved holotype; LACM 11460-1 is poorly preserved and only partly measurable. In LACM 11351-3, the disk is lacking the margin and cannot be measured accurately.

*Careproctus vladibeckeri* is similar in counts and some other features to *C. parviporatus*, but it differs in the larger circumoral pores and more closely spaced mandibular symphyseal pore pair (pm 1–pm 1 = one-half pm 1–pm 2 vs similar), in having a larger terminal mouth (upper jaw 11.4–13.4 vs 7.5% SL and subterminal), more elongated pyloric caeca (7–8 vs 3–4% SL) and more darkly pigmented peritoneum (brown-black vs light brown).

The young female (ZISP 50830) is rather similar to *Careproctus vladibeckeri*. However, it is not included as a paratype because the anus opens just behind the disk, it has more closely spaced mandibular symphyseal pores and a narrower disk (6.8 vs 8–11% SL), and it has three well-developed pectoral radials (2+0+1). It thus remains unidentified.

### *Careproctus zispi* n. sp.

Figure 31

**DIAGNOSIS.** V 50–52 (9–10+41–42), P 24–26, C 11 (1+5/5), radials 4, round, equidistant. Pleural ribs absent. Hypural plate single, unslit. Mouth terminal, oblique; teeth simple and slightly shouldered. Circumoral pores small, mandibular symphyseal pores well spaced. Pectoral fin low, origin

below posterior of preopercle. Gill slit oblique, large. Head 27.6–27.8%, preA 34.3–37.6%, disk 7.6–8.4% SL.

**DESCRIPTION** [Paratypes]. *Counts*: D 46 [44–45], A 40 [39–40], P 25 [24–26], C 11, V 50–52, radials 4, pores 2–6–7–1, gr 8–11, pc 10. *Ratios*: HL 27.6% SL [27.8% in paratype 37 mm SL] its depth 20.6 [21.1], width ca 19 [20], bd 21.0 [23.2], bdA 13.7 [12.7], preA 34.3 [37.6], disk 7.6 [8.4], md 7.8 [8.1], da 3.5 [3.2], aAf 14.9 [14.3], UPL 28.8 [24.6], NL ca 10, LPL 16.5 [13.8], eye 4.7 [4.3], uj 13.7 [13.5], gs 11.8 [10.0].

Head moderately large, width nearly equal to depth. Dorsal outline of head rounded, snout not projecting. Mouth terminal, oblique. Upper jaw reaching below middle of eye. Teeth small, outermost simple, conical, inner slightly shouldered or arrow shaped; densely set, about 4–6 teeth in each anterior oblique row (Fig. 31d), in both jaws forming bands without gaps, premaxillary tooth band at widest equals 9–10% of its length. Eye moderate, almost one-sixth HL. Nostril with raised rim, high on head, about level with upper margin of eye. Circumoral pores small, round, contoured. Symphyseal mandibular pores spaced, interspace pm 1–pm 1 nearly equal to pm 1–pm 2. Gill slit oblique, large, origin level with lower margin of eye, extending forward and ventrally to in front of eighth pectoral ray; length 2.3 times in HL. Operculum small, crescent-shaped, flap extending well behind P base, tip rounded.

Pectoral fin notched, origin low, below posterior edge of preopercle, reaching to slightly behind anal fin origin. Rays gradually shortening to form notch, lowest notch ray one-third length of upper P lobe. Tips of lower P lobe rays free. Pectoral rays 25 (18+7). Basal cartilaginous lamina with four round radials equidistantly spaced. Interradial fenestrae absent. Scapula with short helve, coracoid with small foramen, its helve framed with lateral ribs.

Body moderately elongated, its depth 4.8 times in SL. Postabdominal part rather long, preanal 2.9 times in SL. Interneural of first dorsal fin ray between neural spines 4 and 5. Posterior ray of dorsal fin based on preurostylar vertebra, last anal fin ray on second preural vertebra. Pleural ribs absent. Ventral disk moderately large, diameter about one-fourth HL, flat; margin unsculptured, anterior lobe with slightly convex outline. Hypural plate single, unslit. Pyloric caeca 10, short, about 2% SL.

Skin smooth. Body light, palate rather dark, branchial cavity dusky, peritoneum uniformly dark brown. Stomach not pigmented.

**MATERIAL EXAMINED.** Holotype, LACM 10426-2, male, TL unknown, 51 mm SL, *Eltanin* Stn 973, 55°18'S, 64°47'W, 1922–2229 m, 11 Feb. 1964. Pect. girdle N 680. Paratypes: LACM 10426-3, two juv. sex unknown, 31 and 37 mm SL. Pect. girdle N 681 (37-mm specimen). ZISP N 50911 (formerly LACM 10426-2), juv. male, 33 mm SL. Collected with holotype.

**DISTRIBUTION.** All four known specimens of



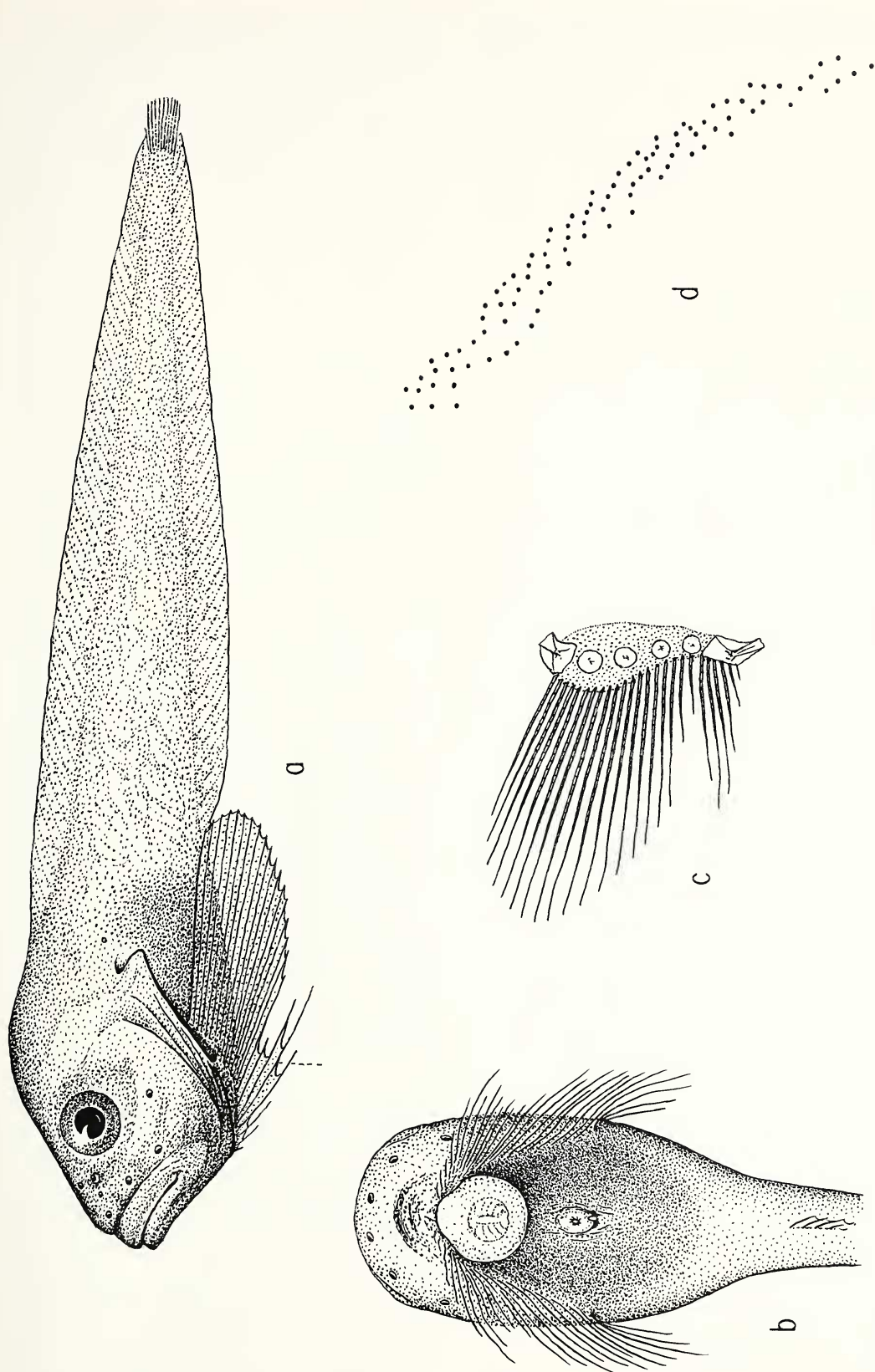


Figure 31. *Careproctus zispai* n. sp. Holotype, LACM 10426-2, 51 mm SL: a, lateral view; b, ventral view. Paratype, ZISP 50911: c, pectoral fin and girdle; d, premaxillary tooth pattern.

*C. zispi* were caught in the northern Drake Passage south of Estados Island, Tierra del Fuego, at a depth of 1922–2229 m. The species may be distributed at similar depths elsewhere in the Drake Passage.

**ETYMOLOGY.** The species is named in honor of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZISP).

**COMMENTS.** The species description is based primarily on the holotype, which is in the best condition. The three paratypes, juvenile specimens 31–37 mm SL, are similar to the holotype, but the mouth is less oblique, and the gill slit is oblique, but shorter (only reaching in front of the fifth P ray in the 33-mm SL specimen). The pectoral fin position is similar to that in the holotype.

*Careproctus zispi* is somewhat similar to *C. parviporatus* but differs in the oblique and larger gill slit (10–12 vs 5.3% SL); the pectoral fin placement forward and ventrally (vs normal); the terminal, oblique mouth (vs subterminal, horizontal); the greater number of principal rays in caudal fin (10 vs 8); and the longer upper jaw and dark brown (vs light brown) peritoneum. *Careproctus zispi* is similar to *C. pseudoprofundicola* in pectoral fin position and the oblique gill slit, but the latter differs distinctly in having a rod-like operculum directed obliquely ventrally (vs small, crescent-shaped, directed caudally), fewer pectoral radials (2 oppositely arranged vs 4 equidistant), more numerous vertebrae (58 vs 50–52), and in the darker peritoneum (black vs dark brown).

## DISCUSSION

The Antarctic fish fauna has long been considered as “the kingdom of nototheniiform fishes.” They were long “known” to comprise three quarters of the Antarctic fish fauna (Norman 1938; Andriashev 1965). However, new information and more complete studies show clearly that in some important respects the Antarctic benthic fish fauna is a complex combination of endemic (“primary”) and non-endemic (“secondary”) families whose distribution varies both geographically and by depth in a pattern we are only beginning to understand. The traditional view has been that notothenioids (primary families) are the oldest Antarctic group, one whose origins date to before the Oligocene/Eocene boundary (i.e., at least >38 Ma), but that secondary families such as liparids, zoarcids, rajids, and others date only to the Pleistocene (DeWitt 1971; Grande and Eastman 1986). Eastman (1993) discussed and summarized current knowledge and hypotheses regarding the history of the Antarctic fish fauna and stressed that the evidence, although inferential, supported tradition. Balushkin (1994) reported an Antarctic fossil notothenioid from the late Eocene, providing physical evidence of the group’s age in the region. If liparids and zoarcids occurred in the Antarctic much earlier than the Pleistocene (Andriashev

Table 3. Number of known southern liparid species by genus.

|                      | Antarctic region | Southern Hemisphere |
|----------------------|------------------|---------------------|
| <i>Notoliparis</i>   | 2                | 3                   |
| <i>Careproctus</i>   | 28               | 41                  |
| <i>Eknomoliparis</i> | 1                | 1                   |
| <i>Genioliparis</i>  | 1                | 1                   |
| <i>Paraliparis</i>   | 32               | 42                  |
| <i>Pseudnos</i>      | 0                | >1                  |
|                      | 64               | 89                  |

1986; Anderson 1988), that could account for their high species diversity.

Gon and Heemstra (1990) and Eastman (1993) considered that notothenioids comprised less than one-half of the fish fauna by number of species. Inclusion of the most recent data suggests that this is not exactly true: there are about 130 described notothenioid species (Balushkin 1992), of which 102 occur in the Antarctic region. Nonendemic Antarctic families include 116 species, suggesting that the proportions are roughly equal. Although it is tempting to use this as a final ratio, it would be unwise, as new species from both groups are still being described (vide this paper). Of the 116 secondary Antarctic species, three families of North Pacific origin comprise 95 species, including 63 species of Liparidae, 29 species of Zoarcidae, and 3 species of Cottunculidae (Gon and Heemstra 1990; this paper); the first is over half of the total number of secondary species (Table 3). Nevertheless, notothenioids still apparently provide by far the majority of the epibenthic fish biomass in the Antarctic Ocean (Everson 1977; Kock 1986). Thus, the secondary species are taxonomically and morphologically diverse, but, perhaps as a result of being distributed primarily in deep water where food supplies are reduced, they are not present as large populations.

The fish family Liparidae is notable for its great morphological and species diversity and for its unusually broad geographic and bathymetric distribution. More than 250 species of about 20 genera of liparids are known, and there is compelling evidence that many more exist undescribed. They are widely distributed in cold and temperate waters of all oceans from the intertidal zone to depths of over 7 km. Until recently, only a few poorly studied liparid species were known from the vast waters of the Southern Hemisphere. However, investigations since the 1960s have resulted in fundamental changes in our knowledge of the liparid fauna of the region. Today, the total number of known liparids in the Southern Hemisphere is more than 90 species. In addition, specimens exist of presently undescribed species of *Careproctus*, *Paraliparis*, and *Pseudnos* from outside the Antarctic region. It

Table 4. Geographic distribution of *Careproctus* species in the Southern Ocean.

|                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Weddell Sea: <i>continentalis</i> *, <i>longipectoralis</i> , <i>parviporatus</i> , <i>polarsterni</i> , <i>vladibeckeri</i>                                                                                                |
| Ross Sea: <i>ampliceps</i> , <i>catherinae</i> , <i>inflexidens</i> *, <i>polarsterni</i> *, <i>pseudoprofundicola</i> , <i>vladibeckeri</i>                                                                                |
| Scotia Sea (depths): <i>acifer</i> , <i>eltaninae</i> , <i>fedorovi</i> , <i>lacmi</i> , <i>leptorhinus</i> , <i>parviporatus</i> , <i>rimiventris</i> , <i>scaphopterus</i>                                                |
| South Shetland Islands: <i>parini</i> *, <i>steini</i> *, <i>tricapitidens</i>                                                                                                                                              |
| South Georgia Island: <i>credispinulosus</i> *, <i>georgianus</i> *, <i>improvisus</i> *                                                                                                                                    |
| South Sandwich Trench and vicinity: <i>sandwichensis</i> , <i>parviporatus</i>                                                                                                                                              |
| Banzare Banks: <i>profundicola</i>                                                                                                                                                                                          |
| Burdwood Bank: <i>falklandicus</i> *, <i>minimus</i> *                                                                                                                                                                      |
| Southeastern New Zealand Plateau: <i>novaezelandiae</i>                                                                                                                                                                     |
| South Africa: <i>albescens</i> (incl. <i>griseldea</i> )                                                                                                                                                                    |
| Patagonia–Falkland region: <i>acaecus</i> , <i>aculeolatus</i> , <i>armatus</i> , <i>atrans</i> , <i>aureomarginatus</i> , <i>cactiformis</i> , <i>falklandicus</i> *, <i>herwigi</i> , <i>macranchus</i> , <i>smirnovi</i> |
| Coasts of Chile: <i>crassus</i> *, <i>pallidus</i> *                                                                                                                                                                        |
| Australia: Seven undescribed species                                                                                                                                                                                        |

\* Shelf and upper bathyal zone.

is clear that contrary to previous thought the liparids are widely distributed and speciose not only in the Northern Hemisphere but in the Southern Hemisphere as well.

Comparatively little is known about the geographic distribution of liparids in the Southern Ocean because most species are known only from single or a few specimens. Since Andriashev’s (1986) review of Antarctic *Paraliparis*, a number of new liparid species have been described (Stein and Tompkins 1989; Duhamel 1992). Nevertheless, because of the relative (and in many cases absolute) rarity of specimens, these works, even with the addition of this paper, are inadequate to allow accurate zoogeographic subdivision of the liparid fauna. However, the evidence is sufficient to conclude that species composition of the fish fauna differs significantly between the Antarctic deep shelf, subantarctic islands, Patagonia–Falkland area, Chile shelf and Peru–Chile Trench, South Africa, and the abyssal depths of the Antarctic Ocean (Table 4). After more information is obtained, some of these areas might be considered in the future to be biogeographic units of some rank.

Bathymetric analysis of the depth distributions of Antarctic liparids yielded unexpected results: unlike the “normal” pattern in which species of *Careproctus* generally occur at shallower depths than those of *Paraliparis*, many Antarctic *Careproctus* species occur at greater depths than *Paraliparis* species. In the Antarctic Ocean, *Careproctus* species occur over a broad depth range—from shelf depths to 5500 m (Table 5). Conversely, *Paraliparis* species occur over a comparatively narrow depth range, most commonly in the upper bathyal zone (500–

Table 5. Bathymetric distribution of *Careproctus* in the Antarctic region.

| No.        |         | Species                                                                                                                                                                                                        |
|------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Depths (m) | species |                                                                                                                                                                                                                |
| 0–100      | 1       | <i>georgianus</i> rarely up to 85 m                                                                                                                                                                            |
| 100–200    | 3       | <i>falklandicus</i> , <i>georgianus</i> , <i>minimus</i>                                                                                                                                                       |
| 200–300    | 2       | <i>georgianus</i> , <i>improvisus</i>                                                                                                                                                                          |
| 300–500    | 2       | <i>continentalis</i> , <i>steini</i>                                                                                                                                                                           |
| 500–1000   | 6       | <i>credispinulosus</i> , <i>novaezelandiae</i> , <i>parini</i> , <i>polarsterni</i> , <i>steini</i> , <i>tricapitidens</i>                                                                                     |
| 1000–1500  | 4       | <i>catherinae</i> , <i>credispinulosus</i> , <i>parini</i> , <i>tricapitidens</i>                                                                                                                              |
| 1500–2000  | 5       | <i>catherinae</i> , <i>profundicola</i> , <i>rimiventris</i> , <i>vladibeckeri</i> , <i>zispi</i>                                                                                                              |
| 2000–3000  | 10      | <i>acifer</i> , <i>catherinae</i> , <i>eltaninae</i> , <i>inflexidens</i> , <i>longipectoralis</i> , <i>pseudoprofundicola</i> , <i>rimiventris</i> , <i>scaphopterus</i> , <i>vladibeckeri</i> , <i>zispi</i> |
| 3000–4000  | 5       | <i>ampliceps</i> , <i>fedorovi</i> , <i>lacmi</i> , <i>parviporatus</i> , <i>scaphopterus</i>                                                                                                                  |
| 4000–5000  | 1       | <i>leptorhinus</i>                                                                                                                                                                                             |
| >5000      | 1       | <i>sandwichensis</i>                                                                                                                                                                                           |

1500 m) and rarely to 2500 m (Andriashev 1986). This pattern is quite different from that in the Northern Hemisphere, where species of *Paraliparis* inhabit generally deeper waters than those of *Careproctus*. The reasons for the opposing patterns are unclear, but they may be related to repeated invasions of the Southern Ocean at different times.

How did southern liparids originate? No fossil evidence is known for the family, nor is there a phylogenetic analysis. Only one cladistic analysis of liparids exists (Kido 1988), and it is based on a paraphyletic group because it included species selected on a regional (geographic) basis, representing genera with known representatives in other regions not included in the analysis. However, there have been many studies presenting evidence for the polarity of a variety of characters (e.g., Burke 1930; Able and McAllister 1980; Andriashev 1986; Kido 1988). Furthermore, the polarities and character states we discuss are based on sister-group studies such as those by Ueno (1970; cyclopterids, *sensu strictu*) and Yabe (1985; cottids). Although these characters have not been the subject of rigorous cladistic analyses, conclusions regarding character importance and polarity are nevertheless very useful because they provide a basis for developing hypotheses that can be tested later when a valid cladistic study is possible. Finally, there are unrelated fish taxa, e.g., the zoarcids, with similar natural history and distribution to liparids, that have been the subject of recent cladistic analyses (Anderson 1988). It is not unreasonable to use the biogeographic results of those studies as the basis for hypotheses about liparid history.

Therefore, to develop hypotheses regarding the



Table 6. Numbers of primary (notothenioid, muraenolipidoid) and secondary (liparid, zoarcid, and other) species occurring in depth zones (modified after DeWitt 1971). Each zone includes all species occurring in that depth range, i.e., many species are counted more than once. Data from Gon and Heemstra 1990; Andriashev 1992a; Balushkin 1990, 1996; Balushkin and Voskoboinikova 1990; Duhamel 1992; Skora 1995; this paper.

| Depth zone                | Primary |   |    | Secondary |    |        |    |
|---------------------------|---------|---|----|-----------|----|--------|----|
|                           | N       | M | Σ  | L         | Z  | others | Σ  |
| Near shore (<88 m)        | 49      | 2 | 51 | 1         | 1  | 7      | 9  |
| Shelf (88–230 m)          | 64      | 3 | 67 | 8         | 4  | 12     | 24 |
| Deep shelf (230–670 m)    | 75      | 3 | 78 | 20        | 15 | 17     | 52 |
| Midslope (670–1500 m)     | 35      | 3 | 38 | 22        | 14 | 15     | 51 |
| Lower slope (1500–2800 m) | 10      | 3 | 13 | 15        | 9  | 10     | 34 |
| Abyssal (>2800 m)         | 1       | 1 | 2  | 12        | 4  | 8      | 24 |

history of Antarctic liparids, we shall rely upon inference supported by the data for other groups. In particular, because deep-water liparids are similar to the zoarcids in their geographic and bathymetric distribution, habitat, reproduction, and early life history (large eggs, low fecundity, direct development), we have reason to think that they are likely to be similar in their zoogeographic history. Anderson (1990) discussed the history of the Antarctic fish fauna, including the phenomenon of tropical submergence (demonstrated by liparids, zoarcids, and rajids), in which representatives of these families occur only in deep, cold waters (Stein 1978; Stehmann 1986; Anderson 1988; Andriashev 1992b, 1993). For instance, several liparid species occur in the Gulf of Panama, but only below 3,000 m depth. This phenomenon effectively eliminates shallow-living northern species from the Southern Hemisphere by providing a temperature barrier they cannot pass. In addition, the high diversity of the tropical shelf fish fauna may also be important (Andriashev 1987). There is only one representative of a shallow-water liparid genus in the Southern Ocean, which needs verification. Two species of *Liparis* have been described “from the Southern Hemisphere:” *Liparis steineni* Fischer 1885 and *Liparis antarcticus* Putnam 1874. Andriashev and Able (1987) concluded that the specimen described as *L. steineni* was of the common arctic species, *L. tunicatus* Reinhardt 1837, and that its collection data was confused and incorrect. *Liparis antarcticus* was described from a single small specimen collected at Puerto Eden, Chile, by the Hassler Expedition; it is now at the MCZ and in poor condition. However, the Hassler expedition collected fishes not only from off South America but also from off California and from San Francisco Bay. Thus, we suspect the specimen is not from Chile but rather is a mislabeled California specimen. Examination by one of us (DLS), in conjunction with the description and careful drawings by Garman (1892) and the description by Burke (1930), show that it is a *Liparis* but not one of the common California species. Further study is needed to draw a final conclusion regarding its identity, but for the present,

the specimen must remain as the only *Liparis* from the Southern Hemisphere.

Schmidt (1904) and Burke (1930) concluded that liparids originated in the North Pacific, and no one since has suggested otherwise. Regan (1914) proposed that North Pacific zoarcid species reached the tip of South America by dispersal along the Pacific continental slopes of the Americas. Andriashev (1965, 1987) supported this hypothesis and found evidence for it among the Liparidae. In Antarctic and adjacent waters, both families evolved secondary centers of speciation at shelf and bathyal depths. This is an extremely interesting example of formation of shelf and even intertidal fauna from relatively deep-sea migrants, probably facilitated by low shallow-water temperatures and lack of competition for some specialized niches. After the opening of the Drake Passage (about 20–22 Ma), southern liparids were able to penetrate into the South Atlantic depths from the South Pacific. Andriashev’s (1990a, 1991b) hypothesis regarding transoceanic (nonarctic) dispersal of secondary deep-sea liparids from the North Pacific through the South Pacific, into the South Atlantic via the Drake Passage, and subsequently into the North Atlantic and the northern deep polar basins is supported by characteristics of two species of *Careproctus* from the deep northeast Atlantic (*C. merretti* Andriashev and Chernova 1988 and *Careproctus* n. sp. Andriashev and Chernova; personal communication). Both of these species have morphological features, including the presence of two opposed pectoral radials, that were previously known only from Antarctic species. The occurrence of 12 species with this character in the South Atlantic strongly suggests the derivation of the Atlantic liparid fauna at least partially from that of the Antarctic region. This hypothesis is in accordance with the role of the Bering Strait as a particularly effective barrier to dispersal of deep-water North Pacific and Bering Sea species into the Arctic Ocean (Briggs 1974; Andriashev 1991b).

Comparing the distributions of the primary and secondary Antarctic species is instructive (Table 6). It is clear that the former (notothenioids) dominate

on the “shelf,” but they decrease below “deep shelf” depths (230–670 m), and at midslope depths (670–1500 m), the latter (especially liparids and zoarcids) become dominant. With one exception, notothenioids disappear altogether between 2000–3000 m depth. The distributional similarity of liparids and zoarcids supports the hypothesis of their similar zoogeographic histories, as discussed above. This clear pattern of replacement and complementarity suggests several questions. Why did liparids and other secondary deep-living families not colonize shallower depths more successfully? Why did notothenioids not colonize deep water?

The answer to the first is probably that the notothenioids evolved in shallow water and diversified before the arrival of the secondary Antarctic groups. In that case, the pre-Pleistocene notothenioids, as now, would have been a highly specialized fauna limiting opportunities for liparids to radiate into waters shallower than those through which they came. In addition, the liparid genera able to colonize the Southern Hemisphere are deep-water forms and were therefore already highly adapted to life under those conditions. The species of *Liparis*, *Polypera*, *Crystallichthys*, and other primitive groups that are more successful in shallower waters could not expand south of the temperate northern seas.

Why notothenioids failed to colonize deep water successfully is not as evident. Considering the probable answer to the first question above, it seems likely that if they had done so, opportunities for newer arrivals would have been much fewer. On the other hand, perhaps there were deep-water species that became extinct under pressure from the secondary groups that were better adapted to deep-water life. Eastman (1993:132, table 8), basing his conclusions upon Andriashev (1965, 1987), considers the secondary fauna to be younger and, therefore concludes that these ancestral elements must have found deeper waters to be a depauperate zone that promoted their diversification and radiation. It is significant that the younger notothenioid families (most genera of Nototheniidae, Artedidraconidae, Bathydraconidae, and Channichthyidae) do occur in the deeper waters; older taxa (Bovichtidae, Harpagiferidae, and two genera of Nototheniidae) have no representatives at bathyal depths. Based on the fossil record, the older notothenioid families apparently evolved in the Eocene (Andriashev 1987; Balushkin 1994; Eastman 1993) before the arrival of the secondary groups in the Miocene (Anderson 1988). If this chronology is correct, we suggest that the explanation for the absence of notothenioids and their replacement by liparids in deeper water is that when the liparids arrived, they found a depauperate environment, resulting in rapid radiation and morphological diversification. When the younger notothenioids evolved into deeper water, there were fewer opportunities available and therefore their expansion was limited. Thus, the pattern we see today is the result of several stages in commu-

nity evolution involving competitive interactions between a number of families from the Eocene to the present time. Our historical hypothesis might be testable if sufficient biological data become available to allow comparison of the ecological roles of species in the liparids, zoarcids, and younger notothenioids.

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